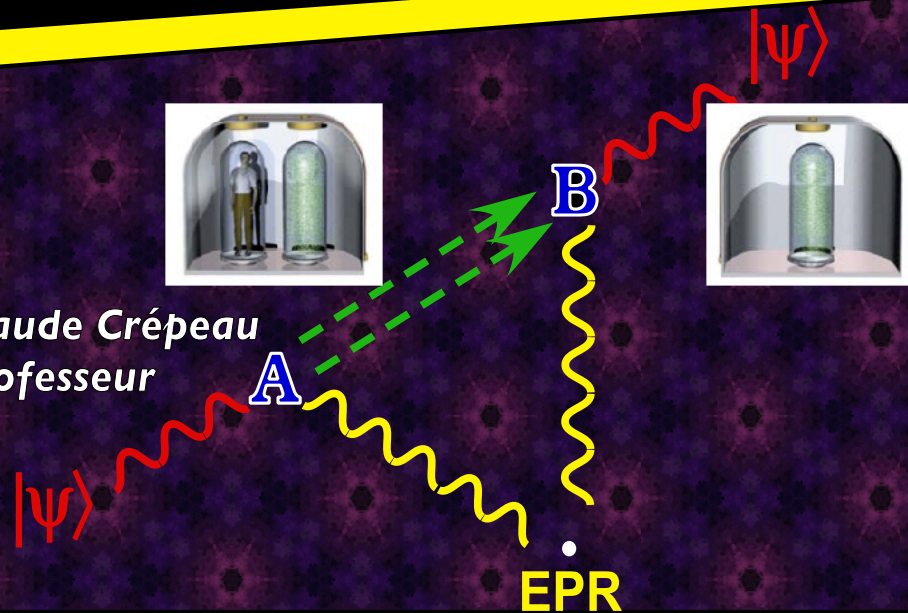


La solution à tous les problèmes !

La Téléportation Quantique

POUR
LES NULS[®]

Claude Crépeau
professeur

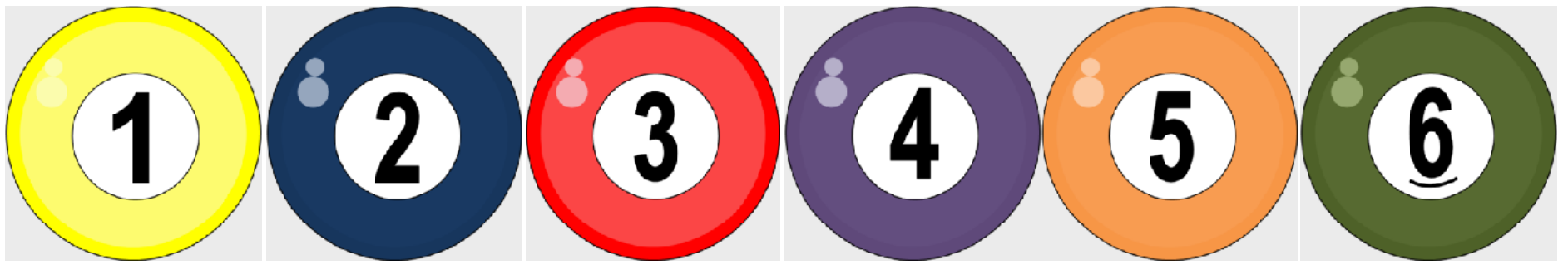


À mettre entre toutes les mains!

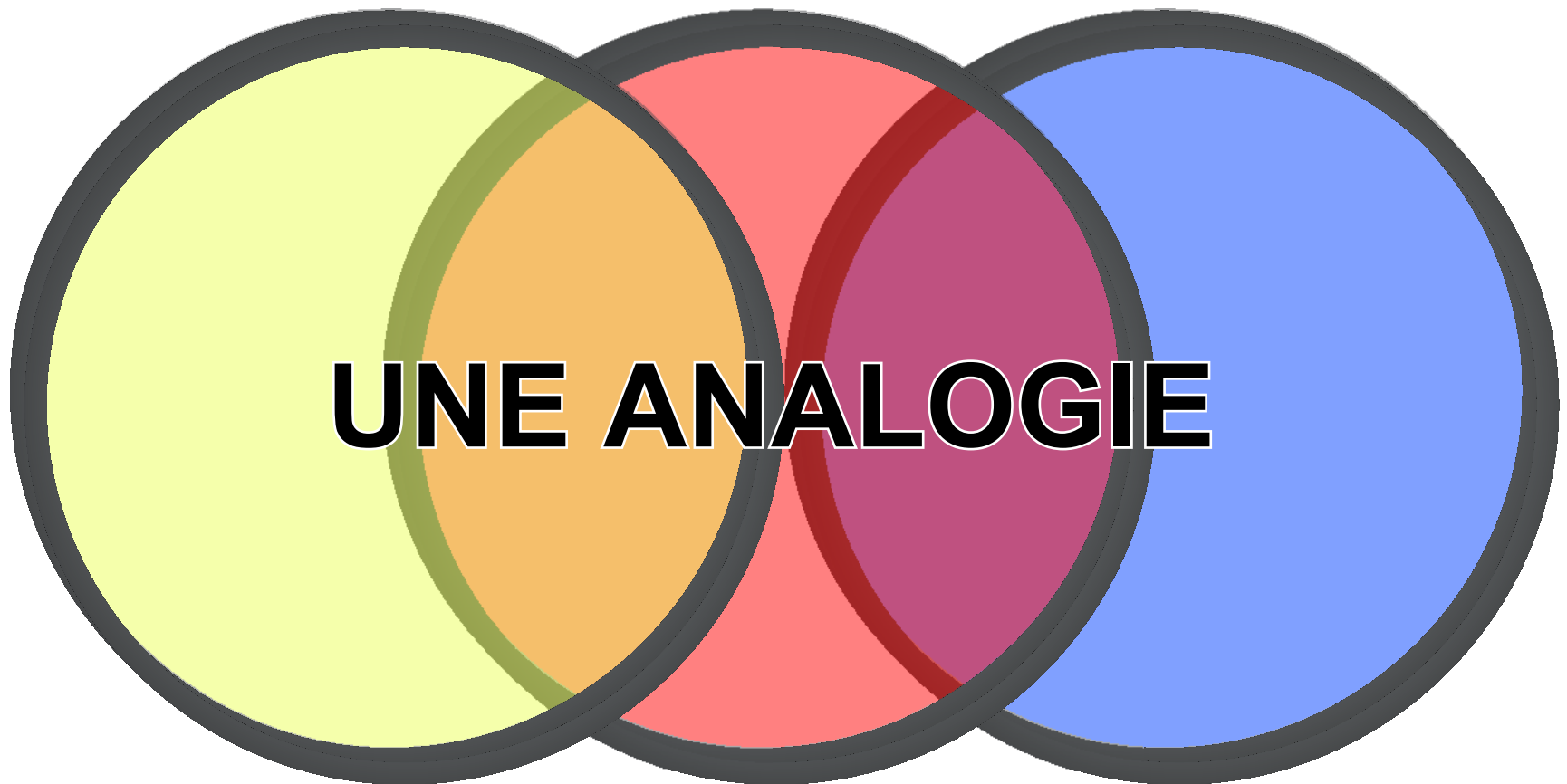


Having persuaded their co-authors to go first to establish safety and efficacy, Jozsa and Bennett depart Japan using the new facility.

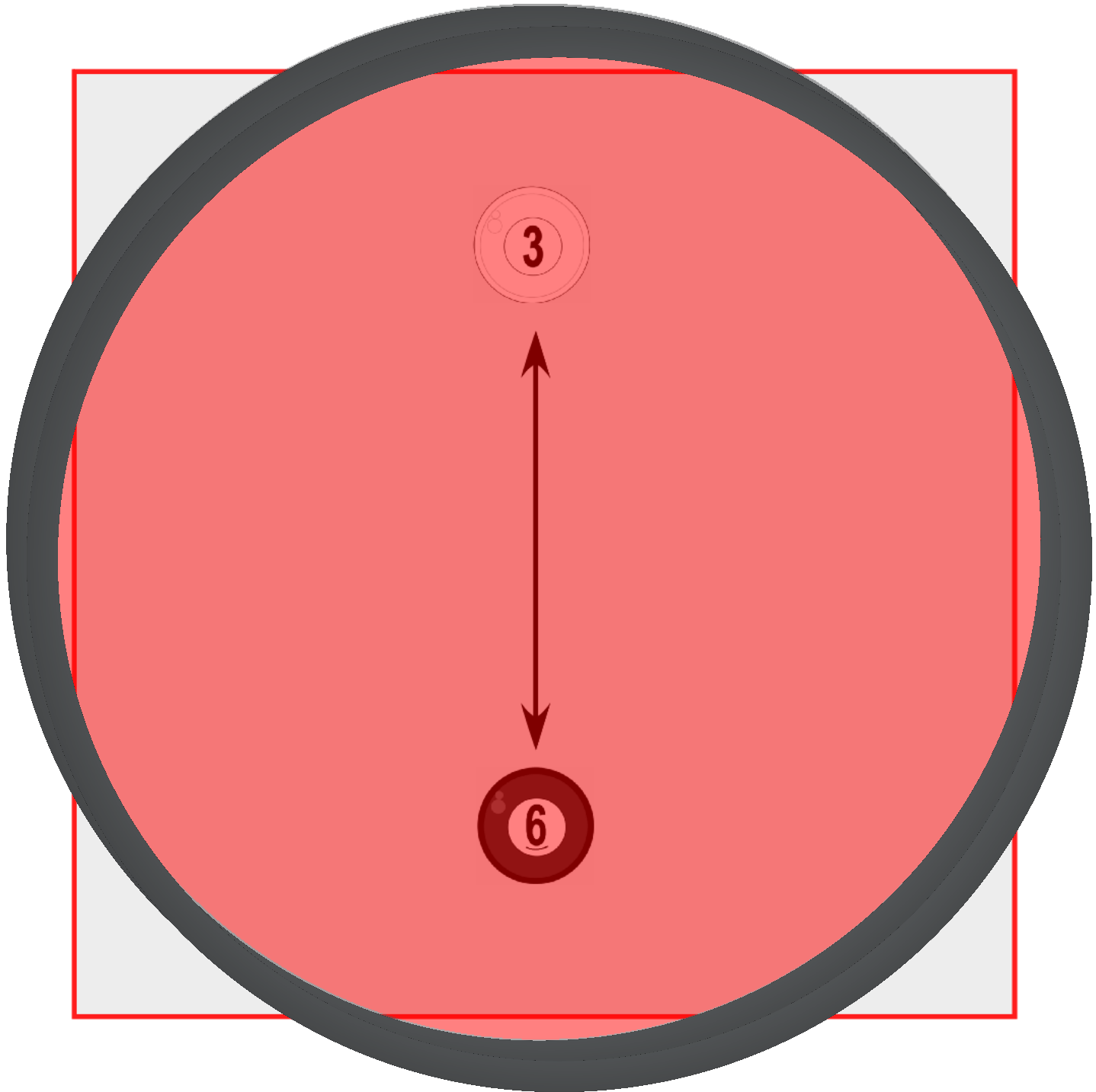
Information
Quantique

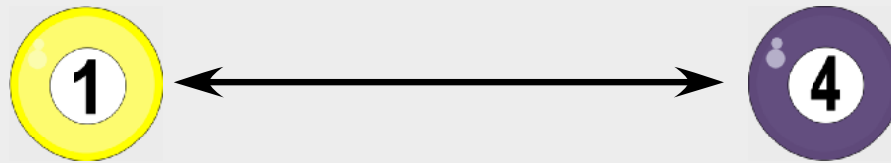


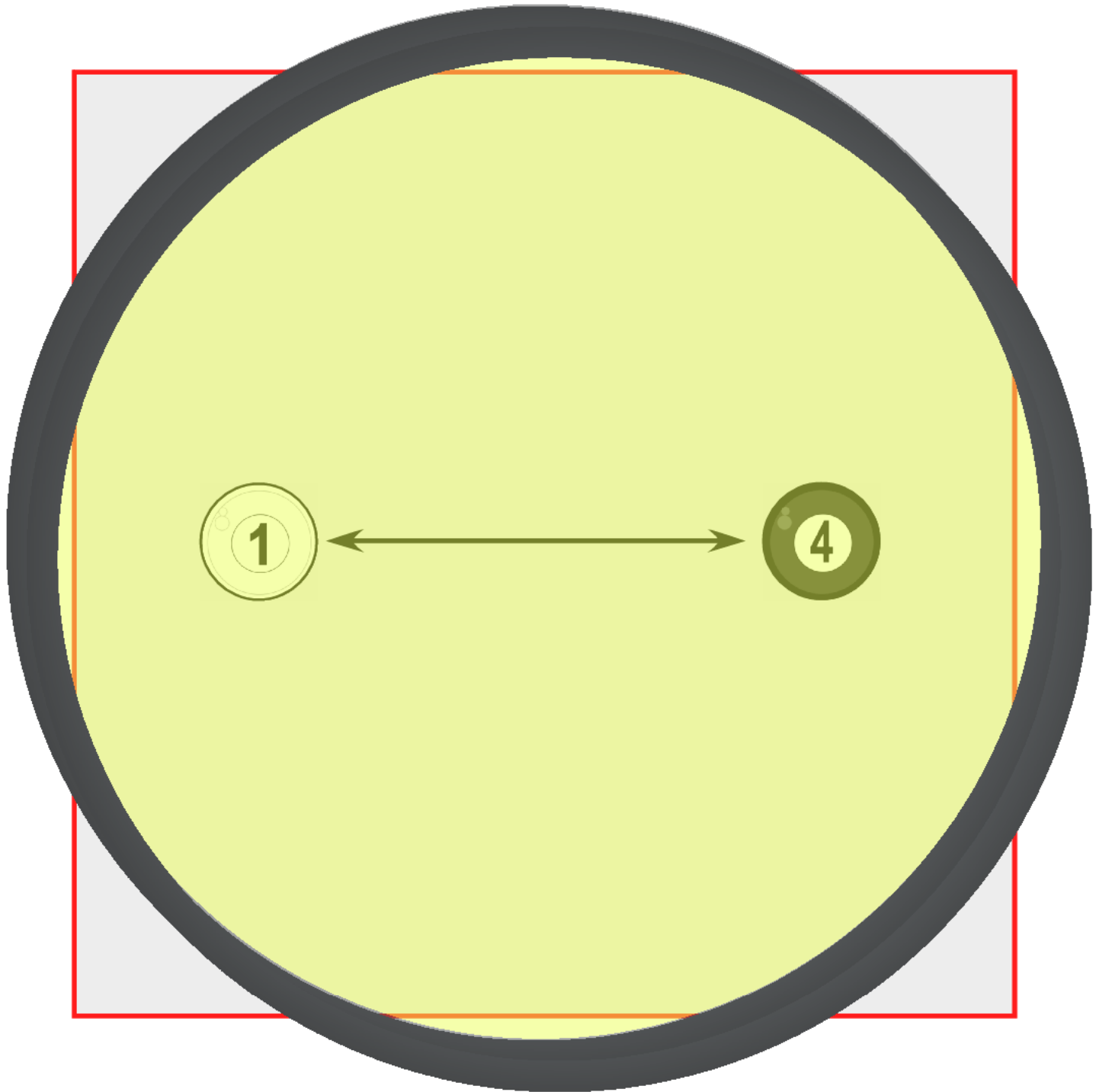
Couleurs et Filtrés

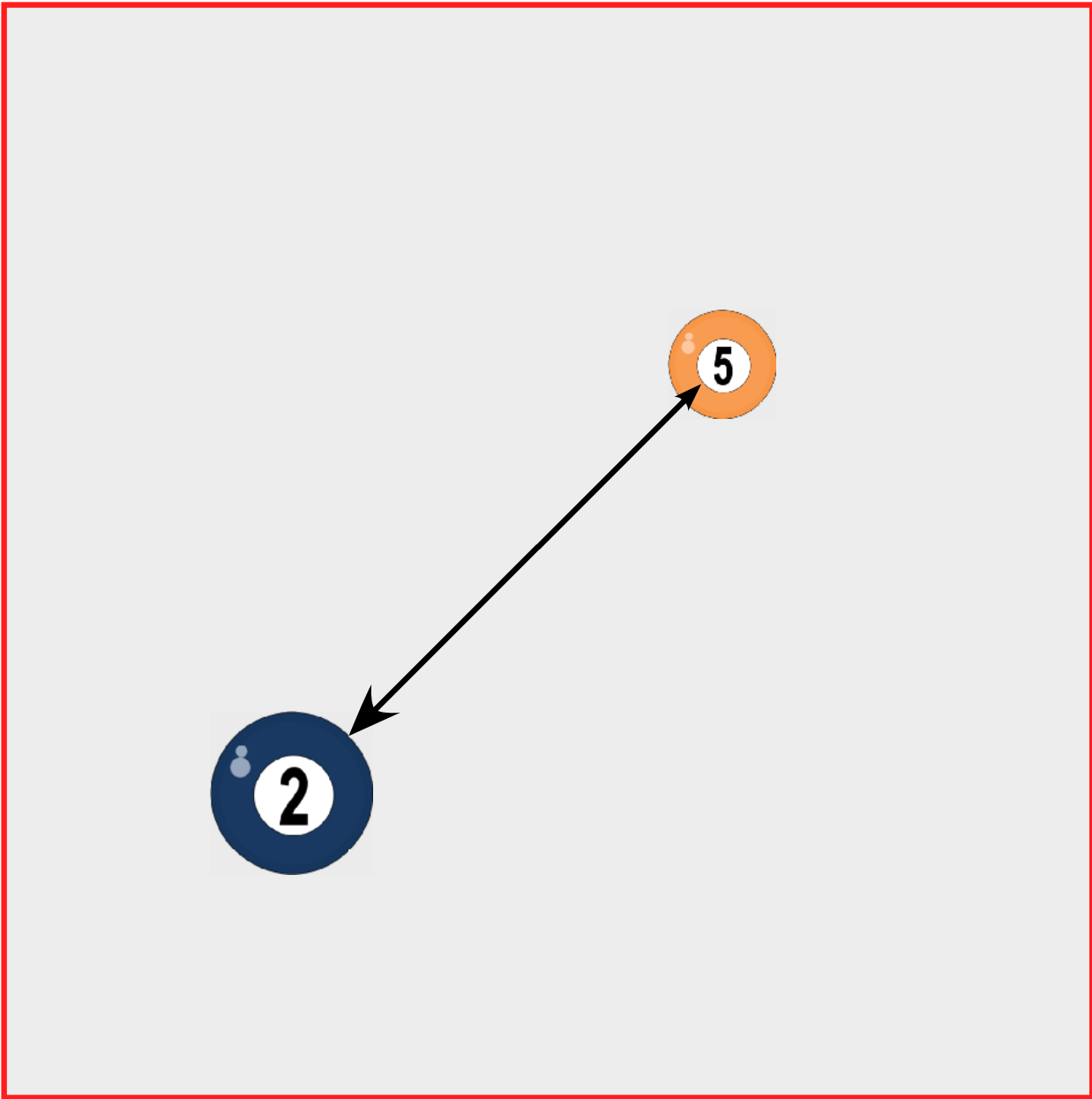


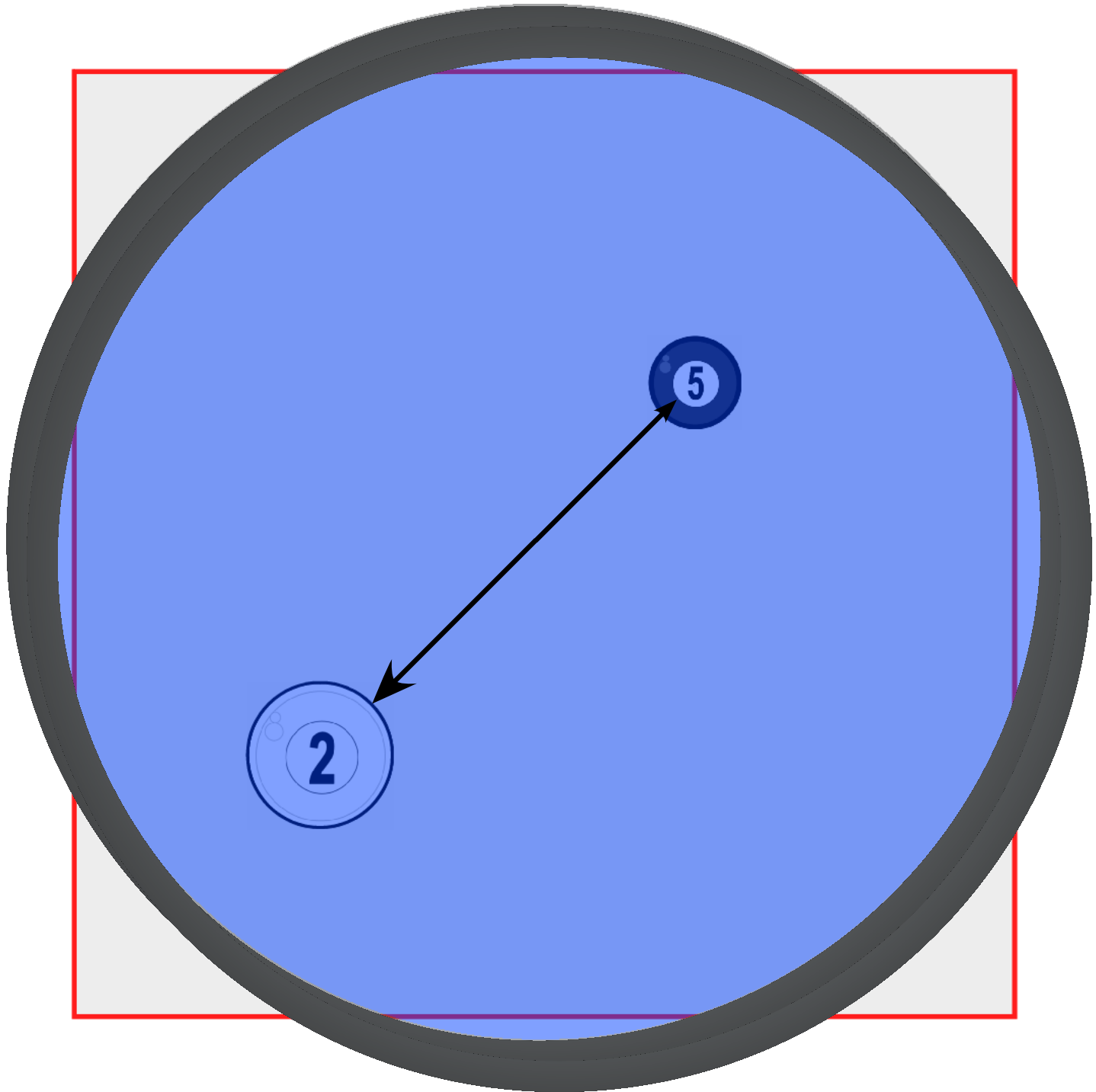


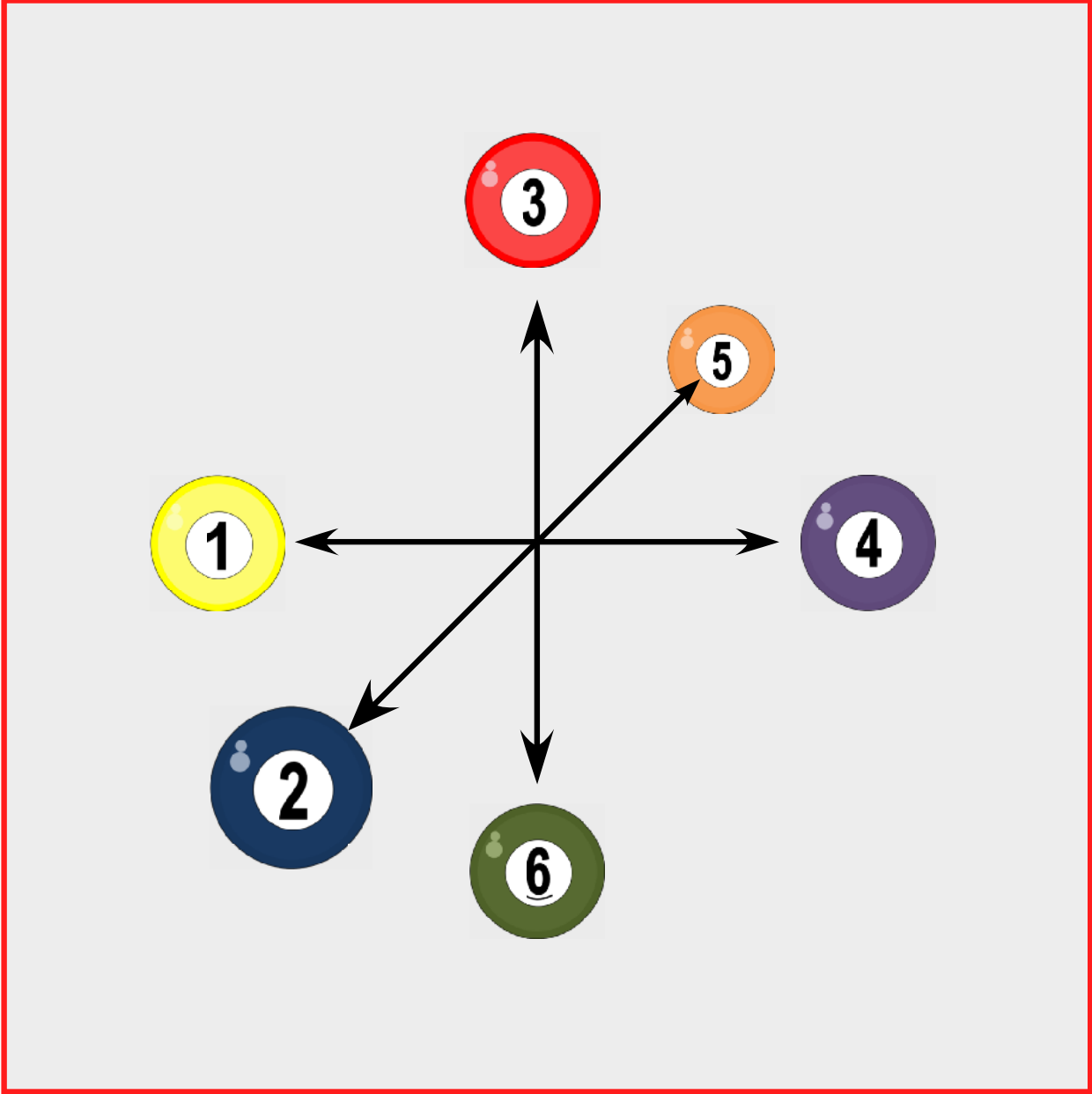


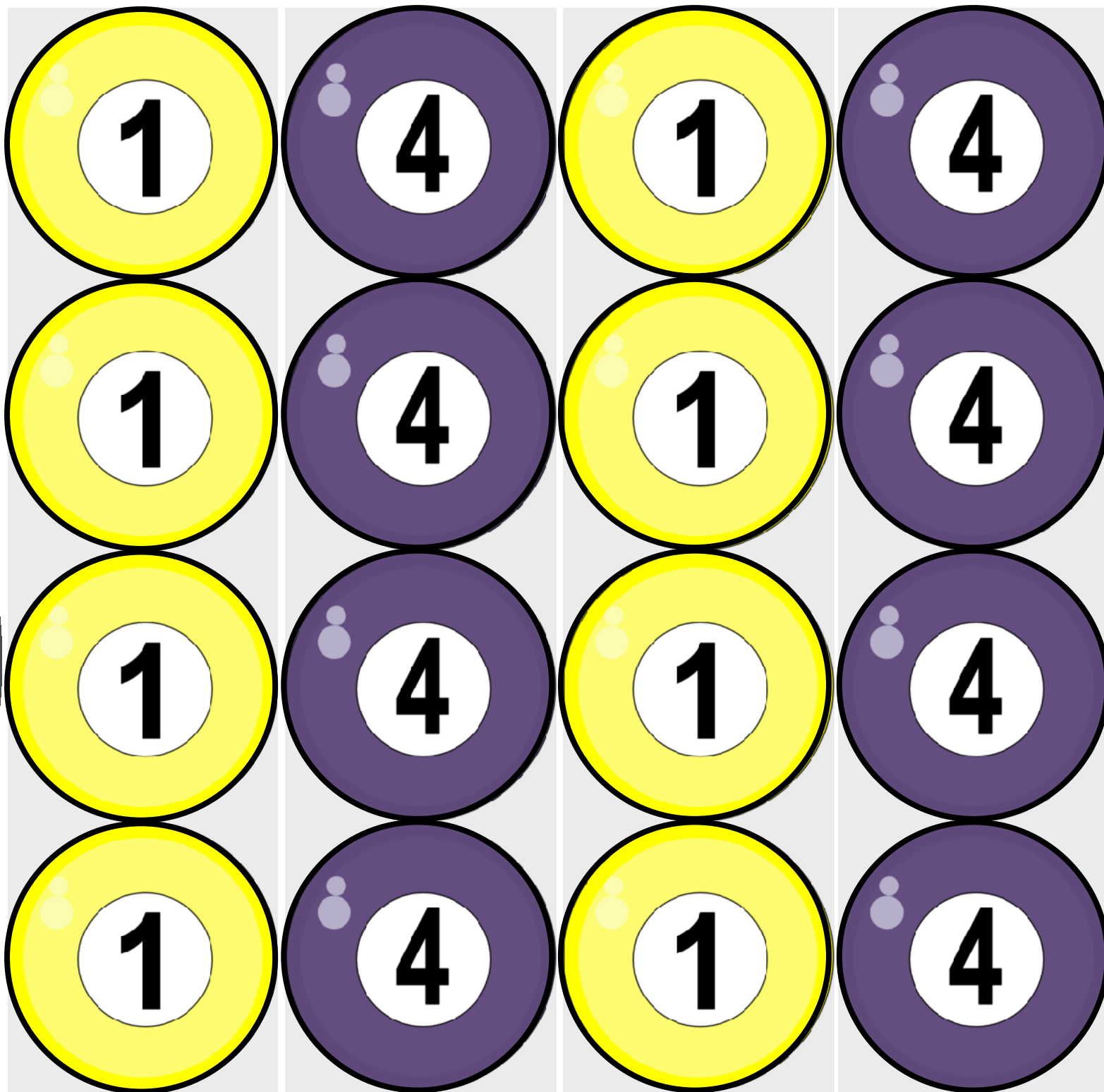


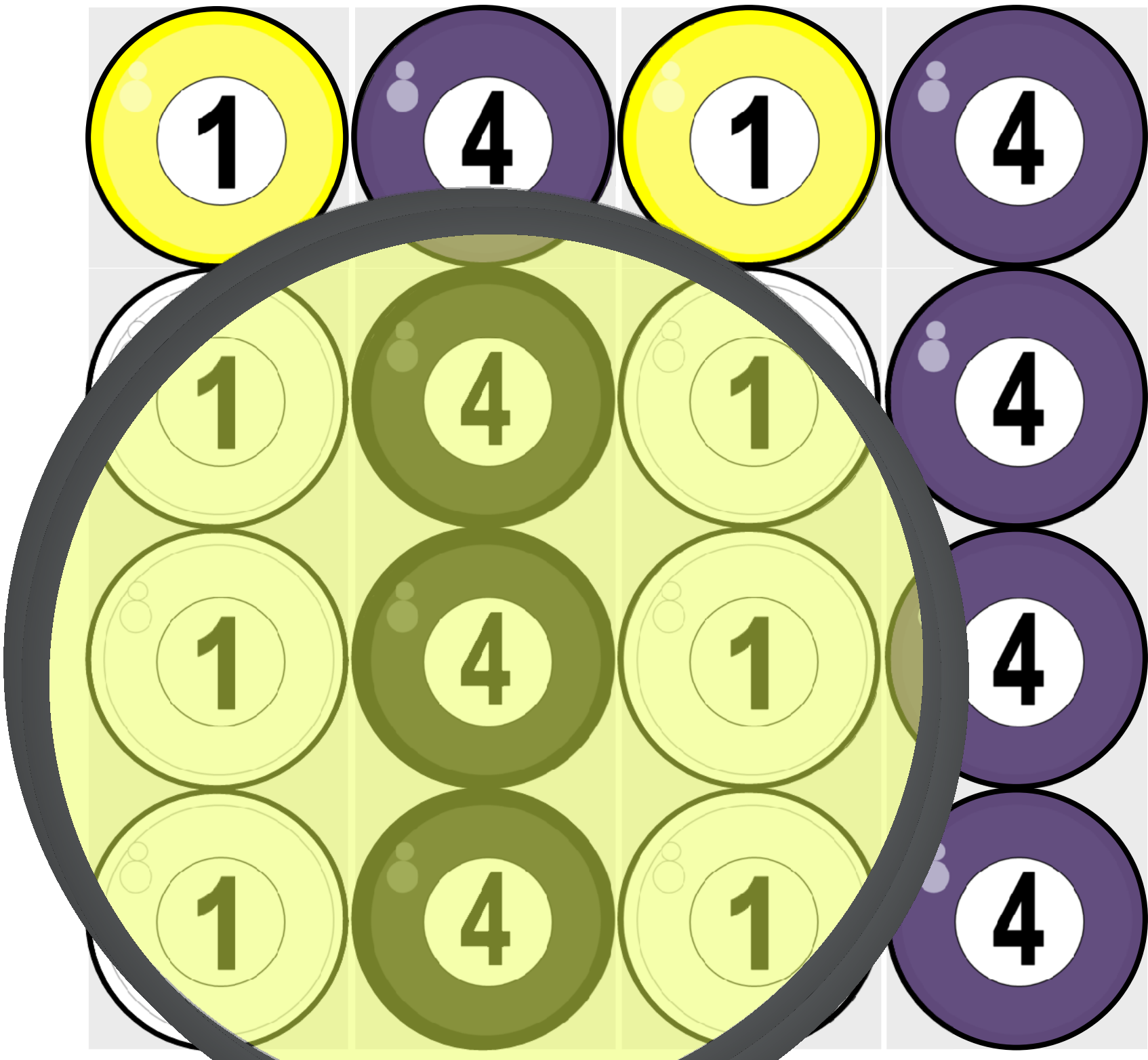












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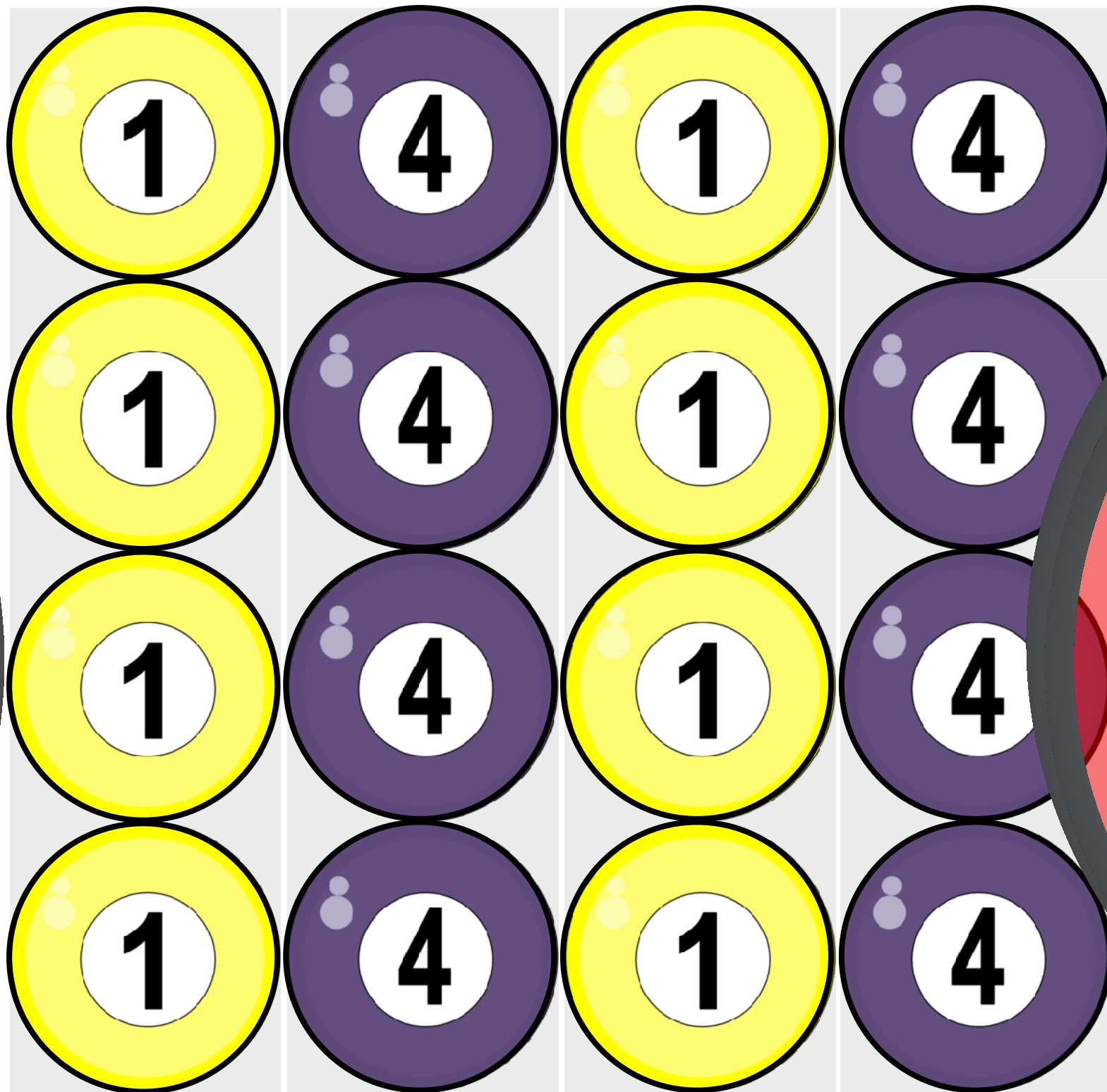
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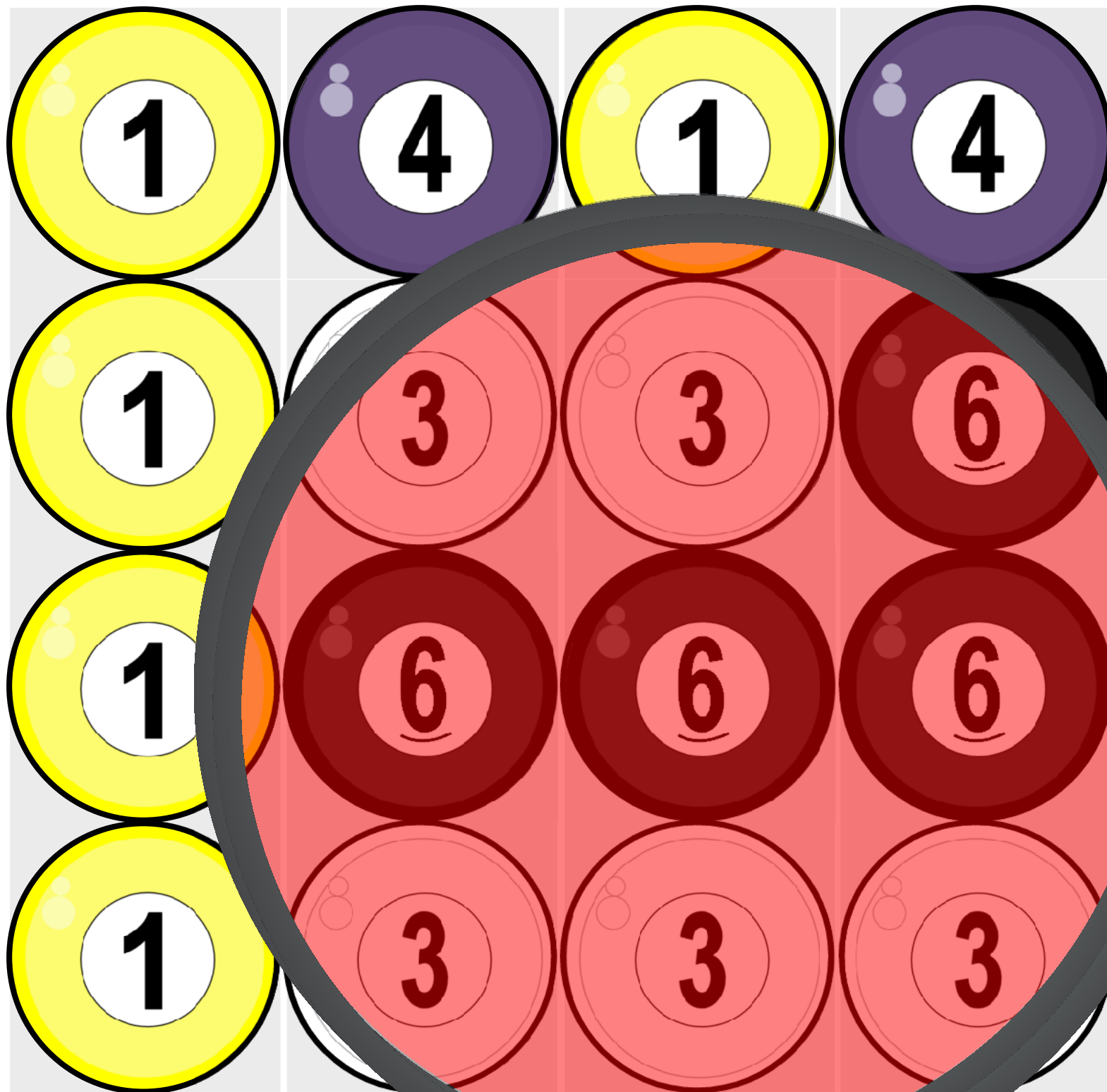
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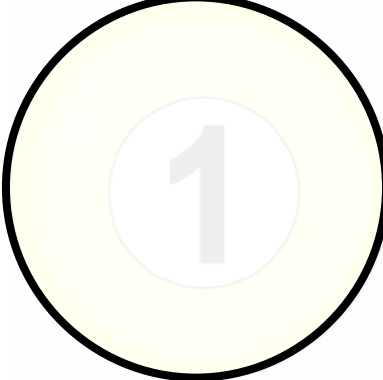
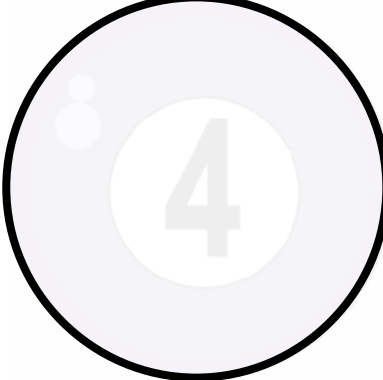
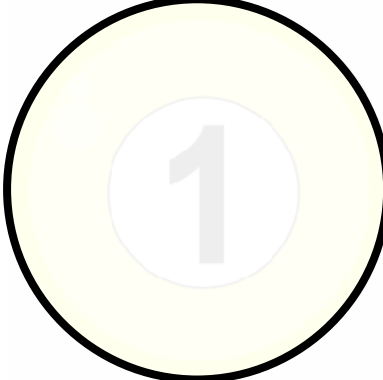
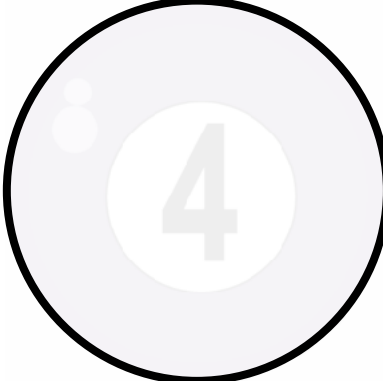
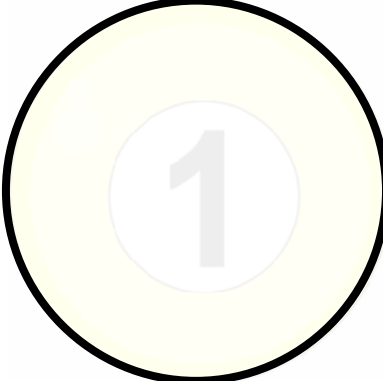
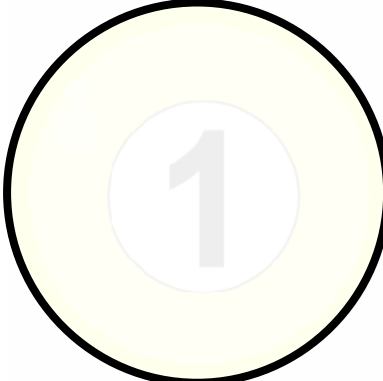
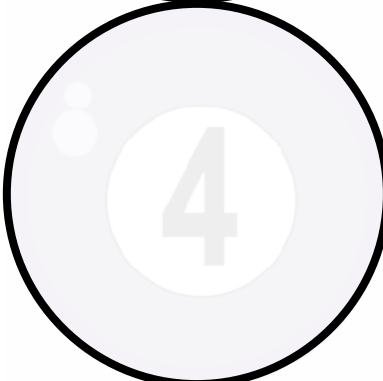
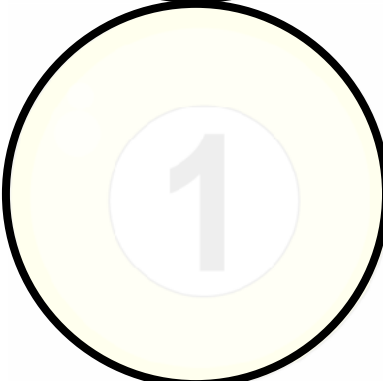
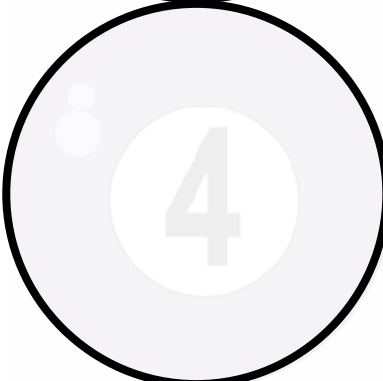
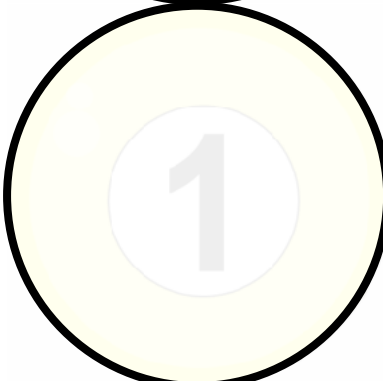
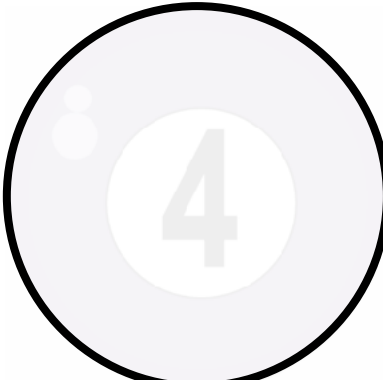
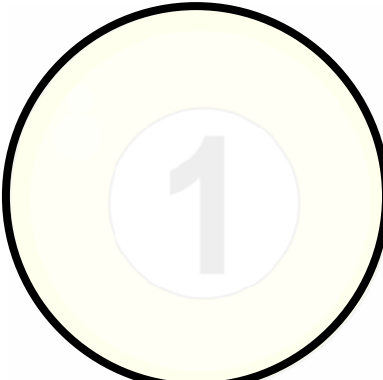
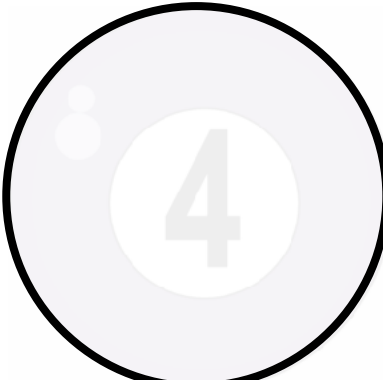
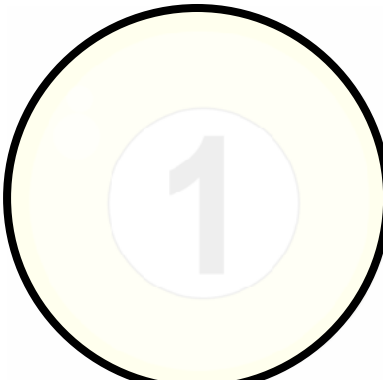
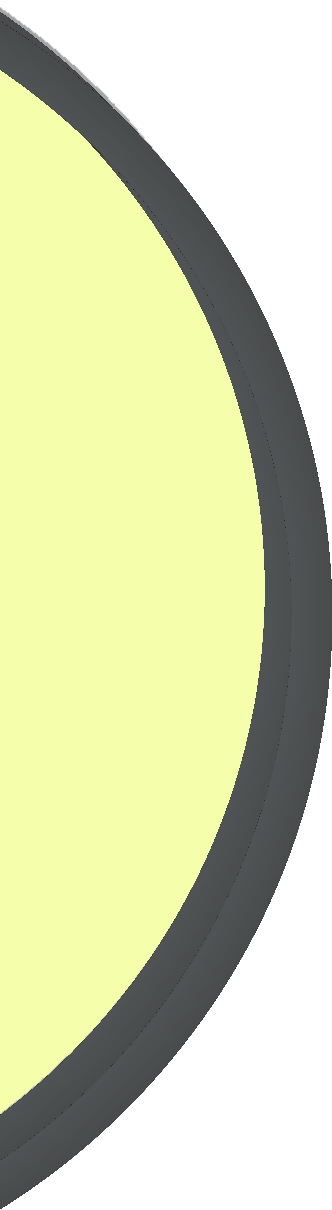
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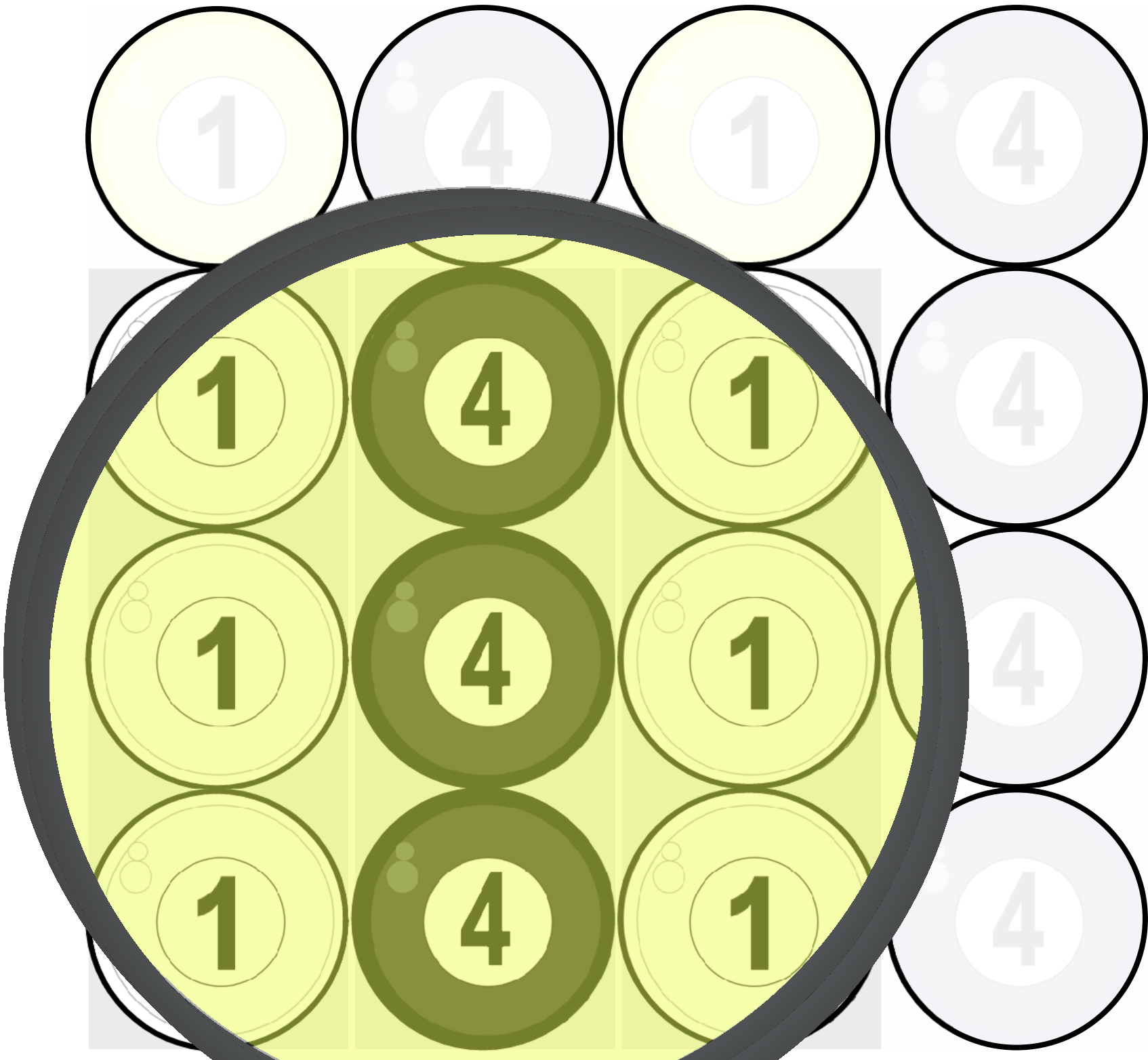
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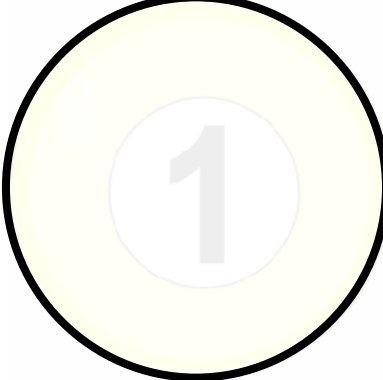
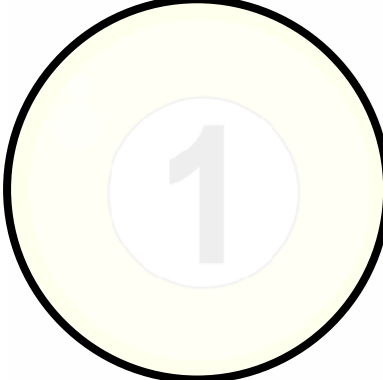
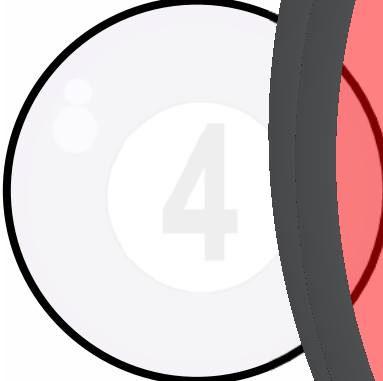
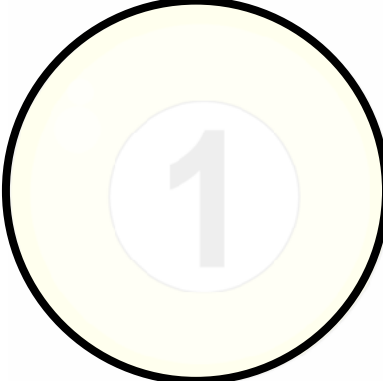
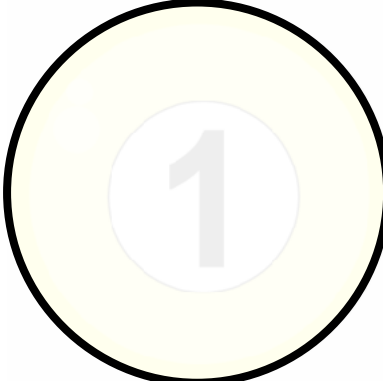
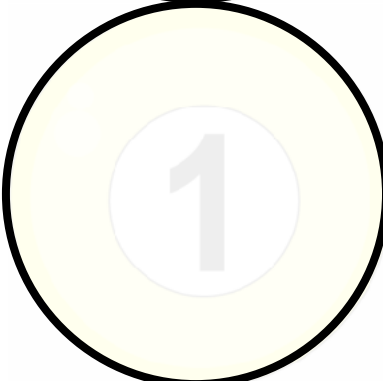
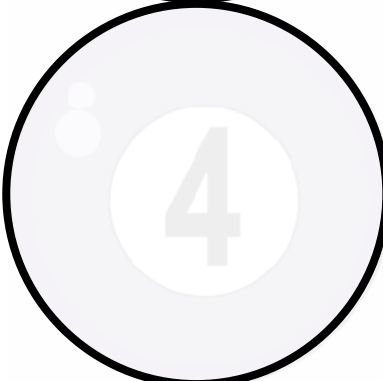
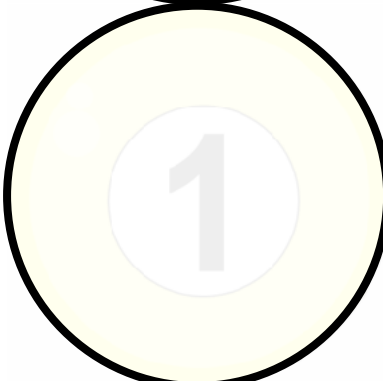
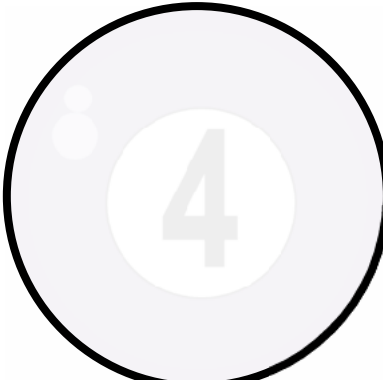
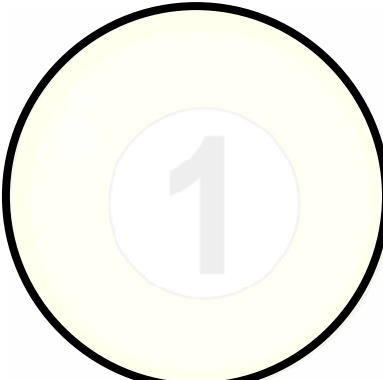
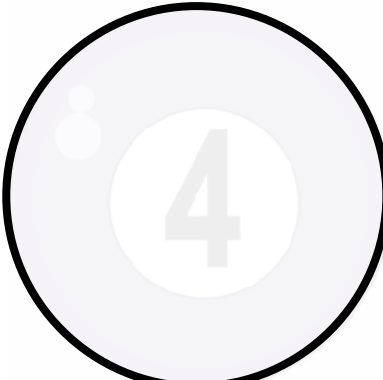
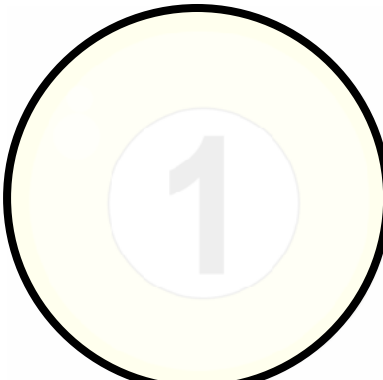
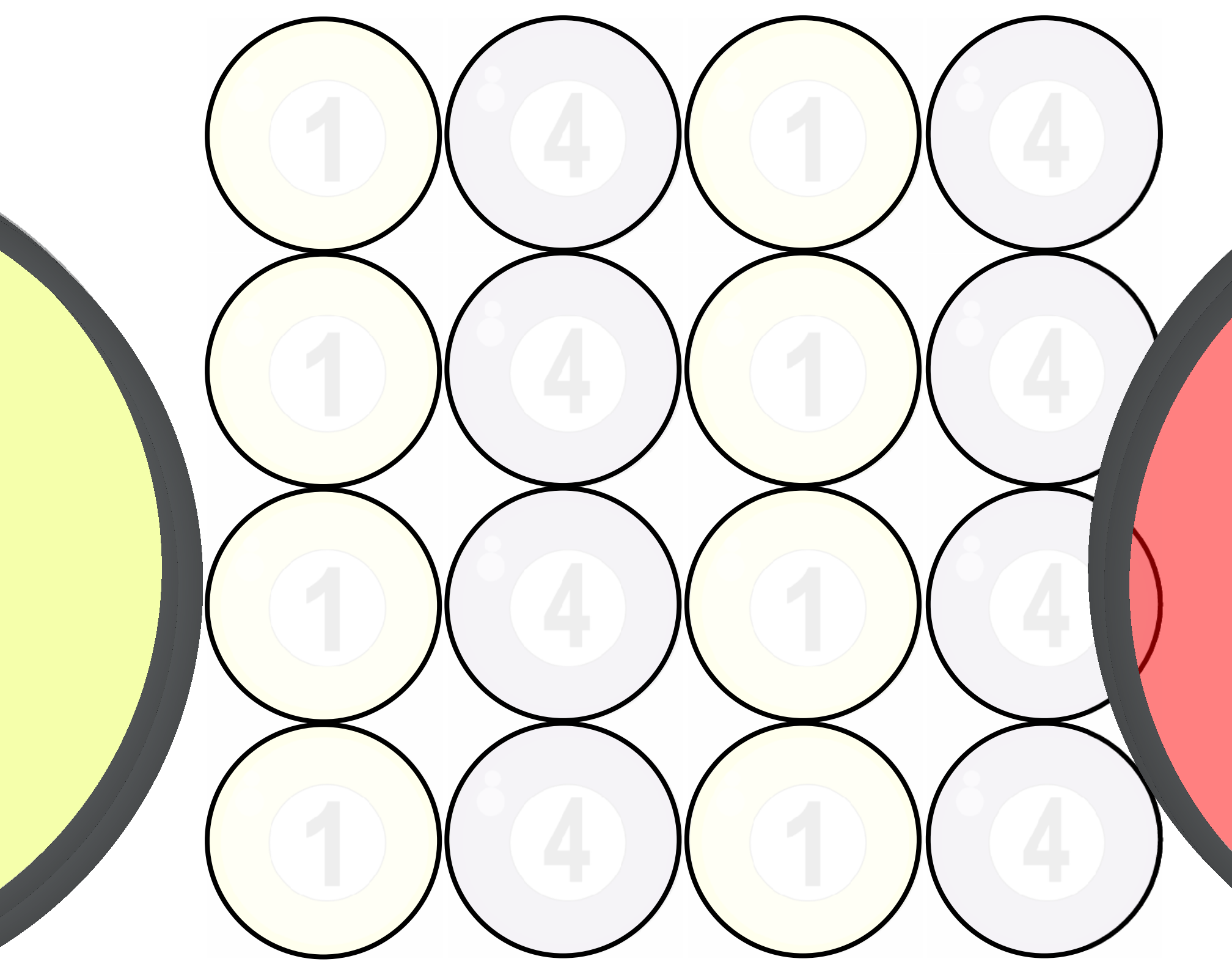


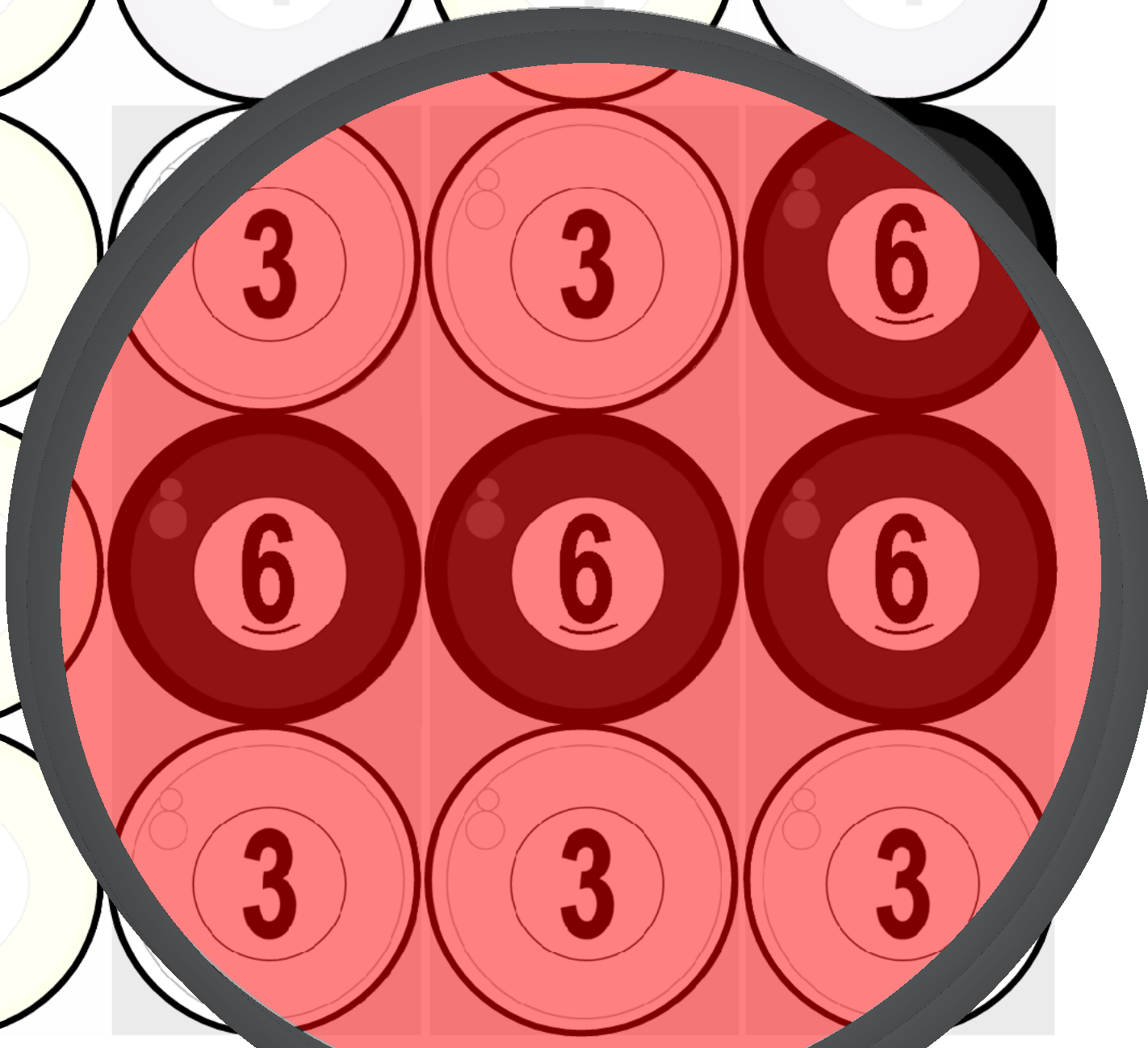
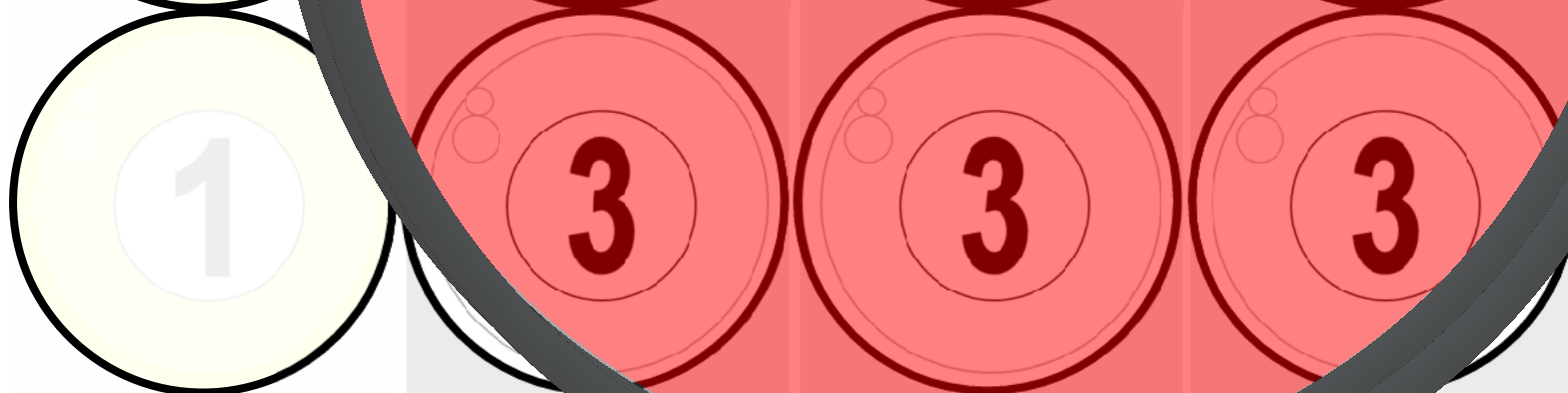
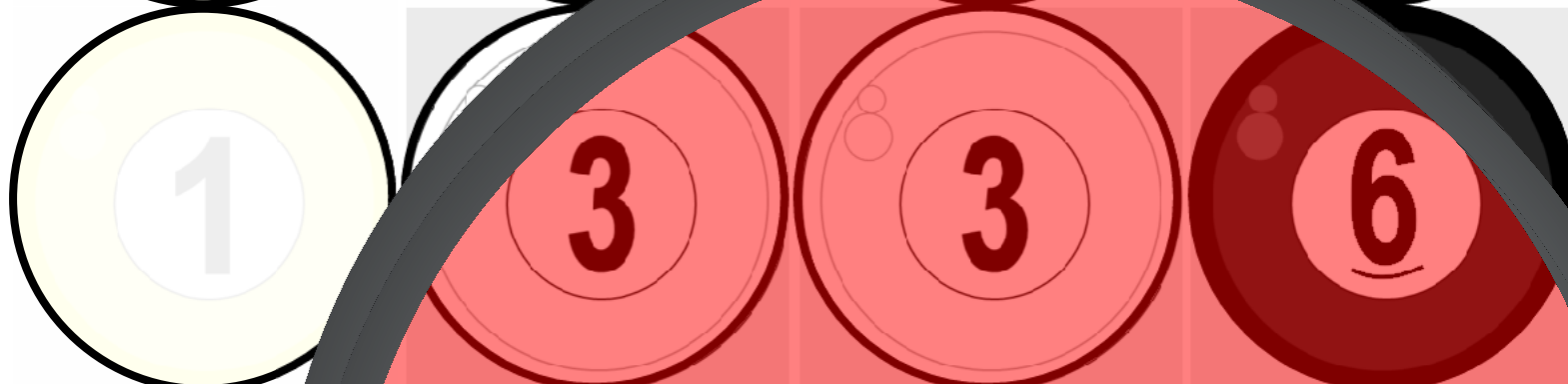
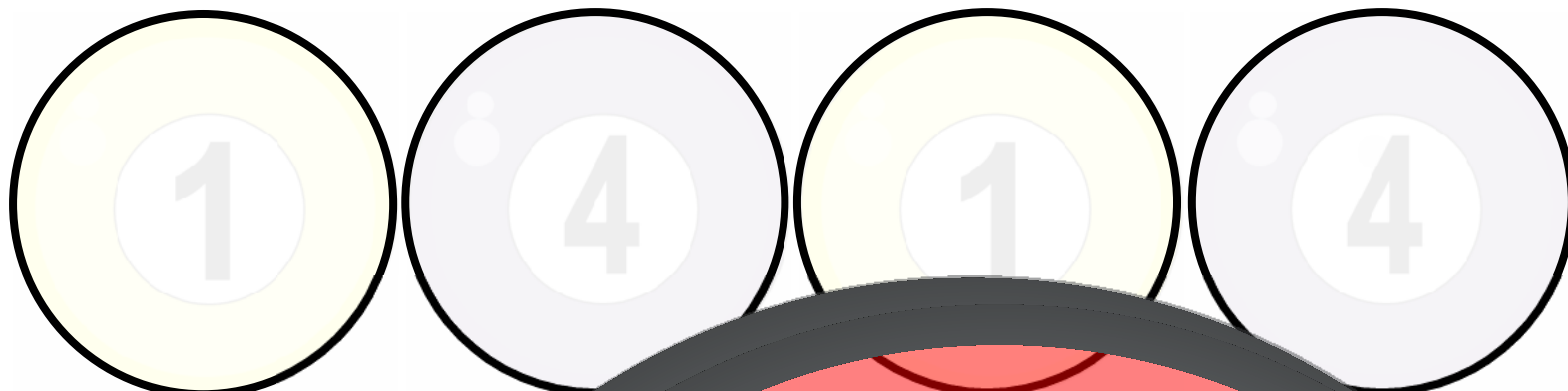


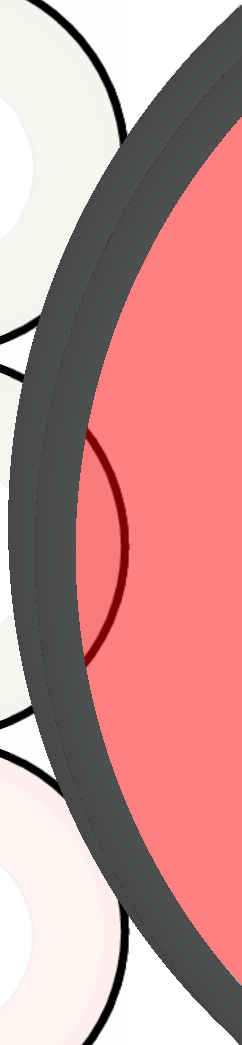
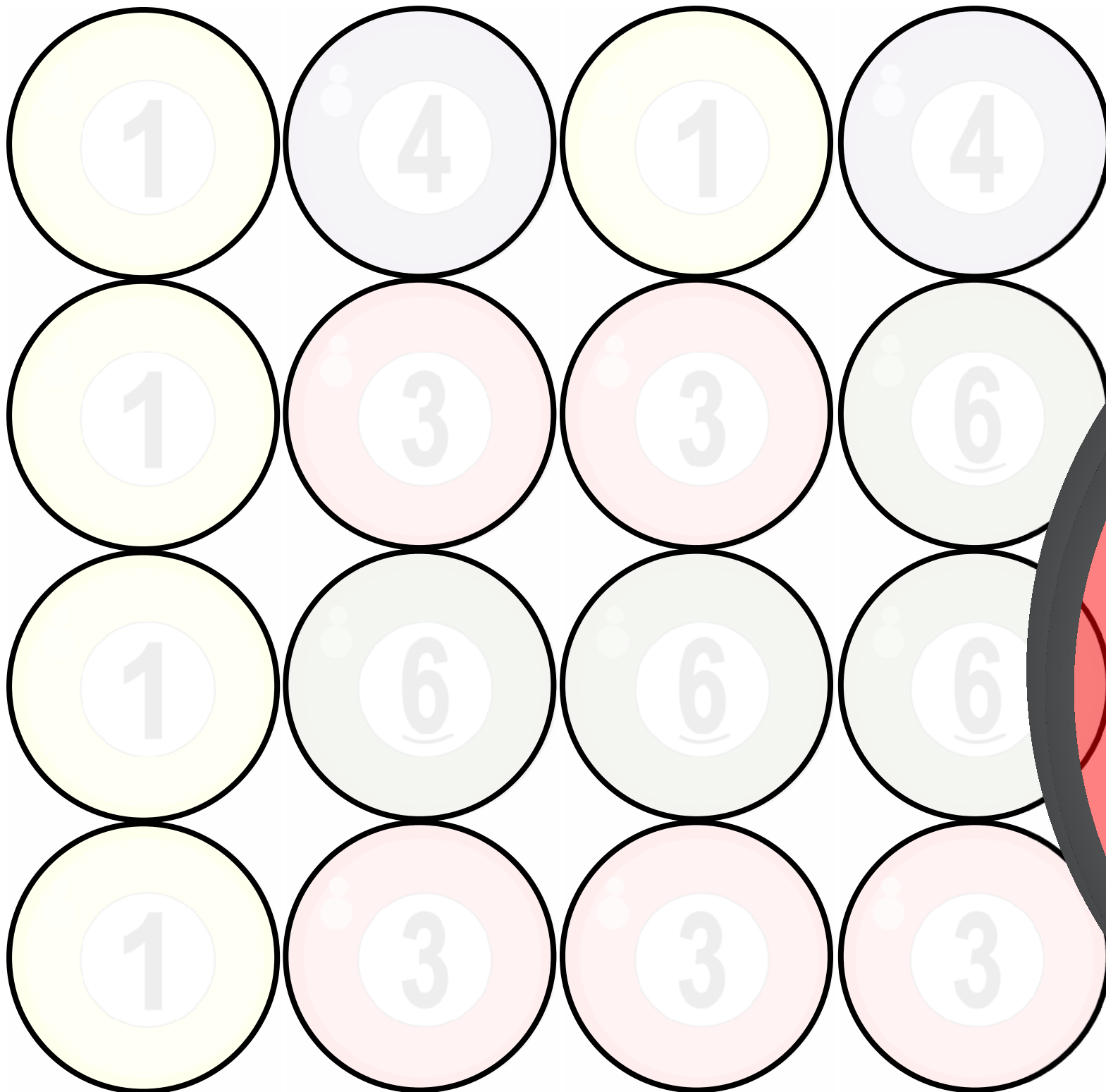
Couleurs et **Filtres**:
mais qu'arrive-t-il en réalité ?



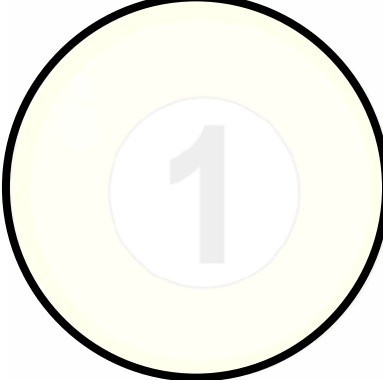
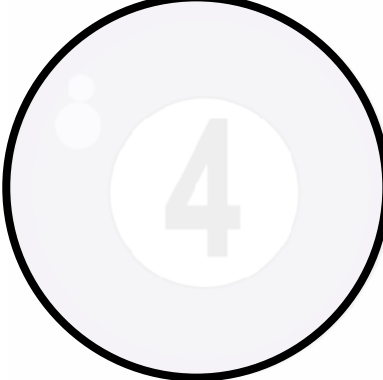
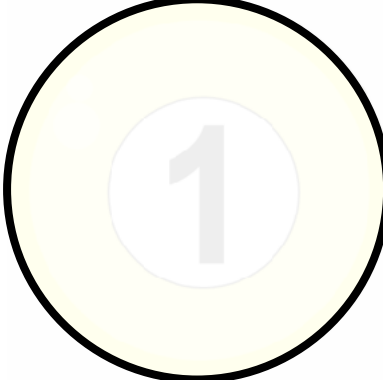
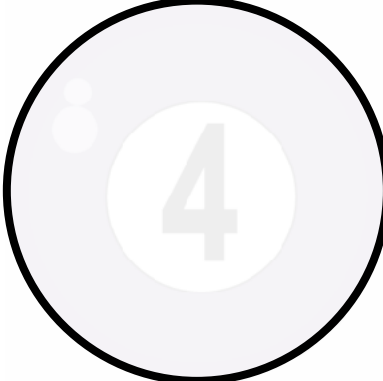
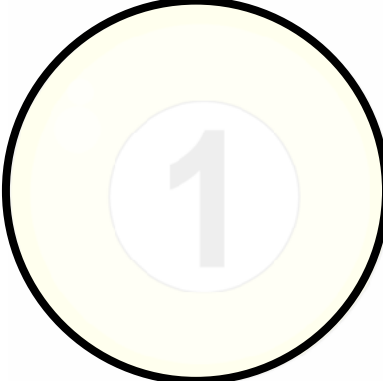
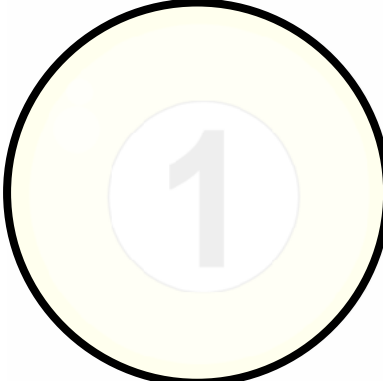
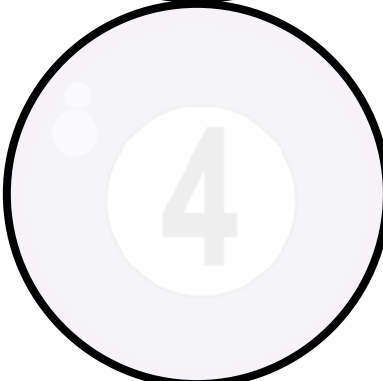
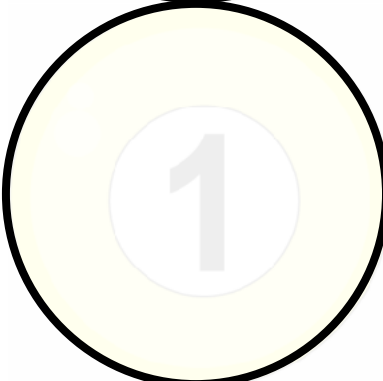
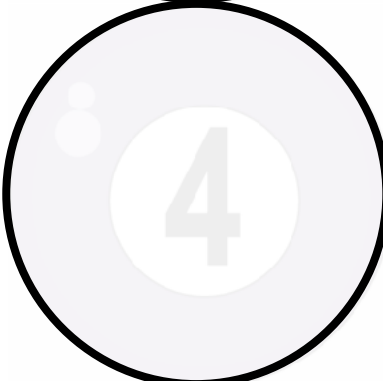
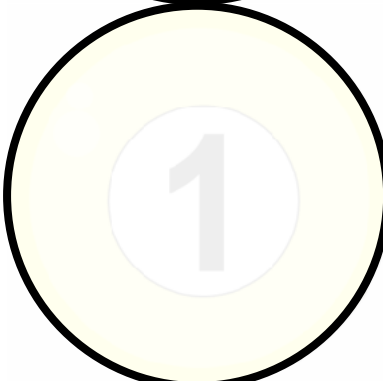
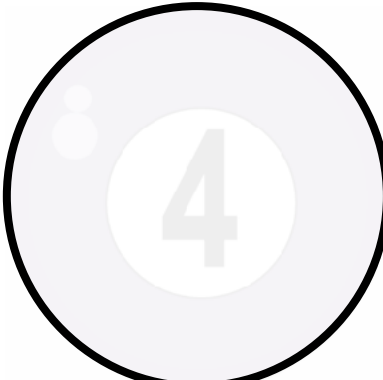
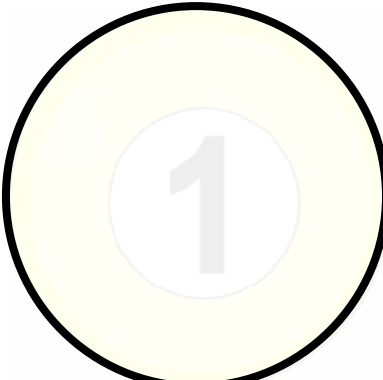
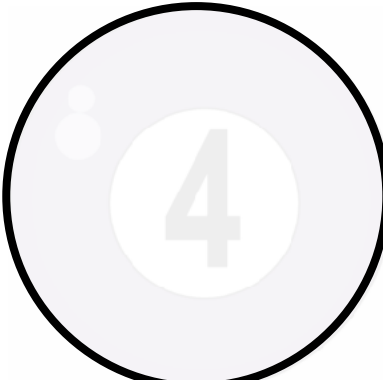
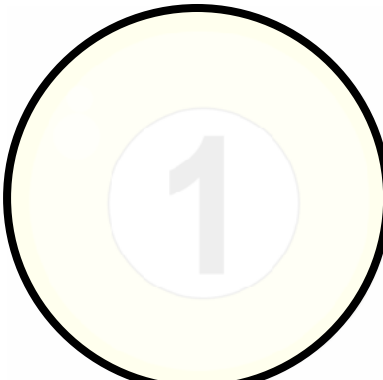
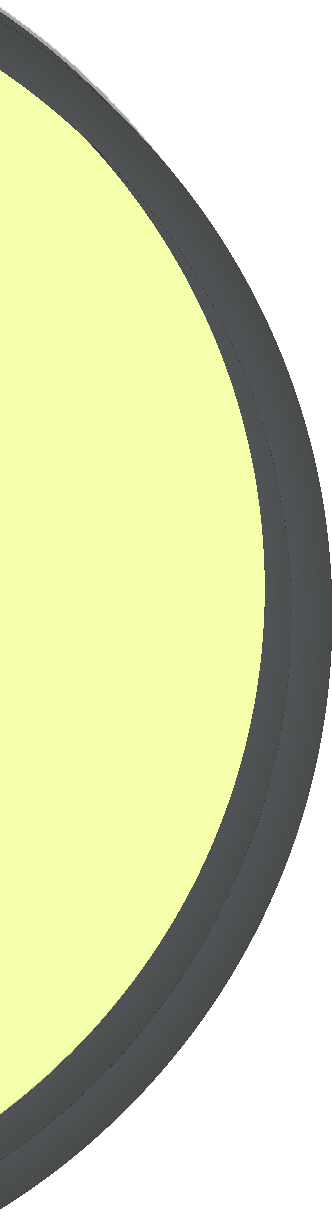


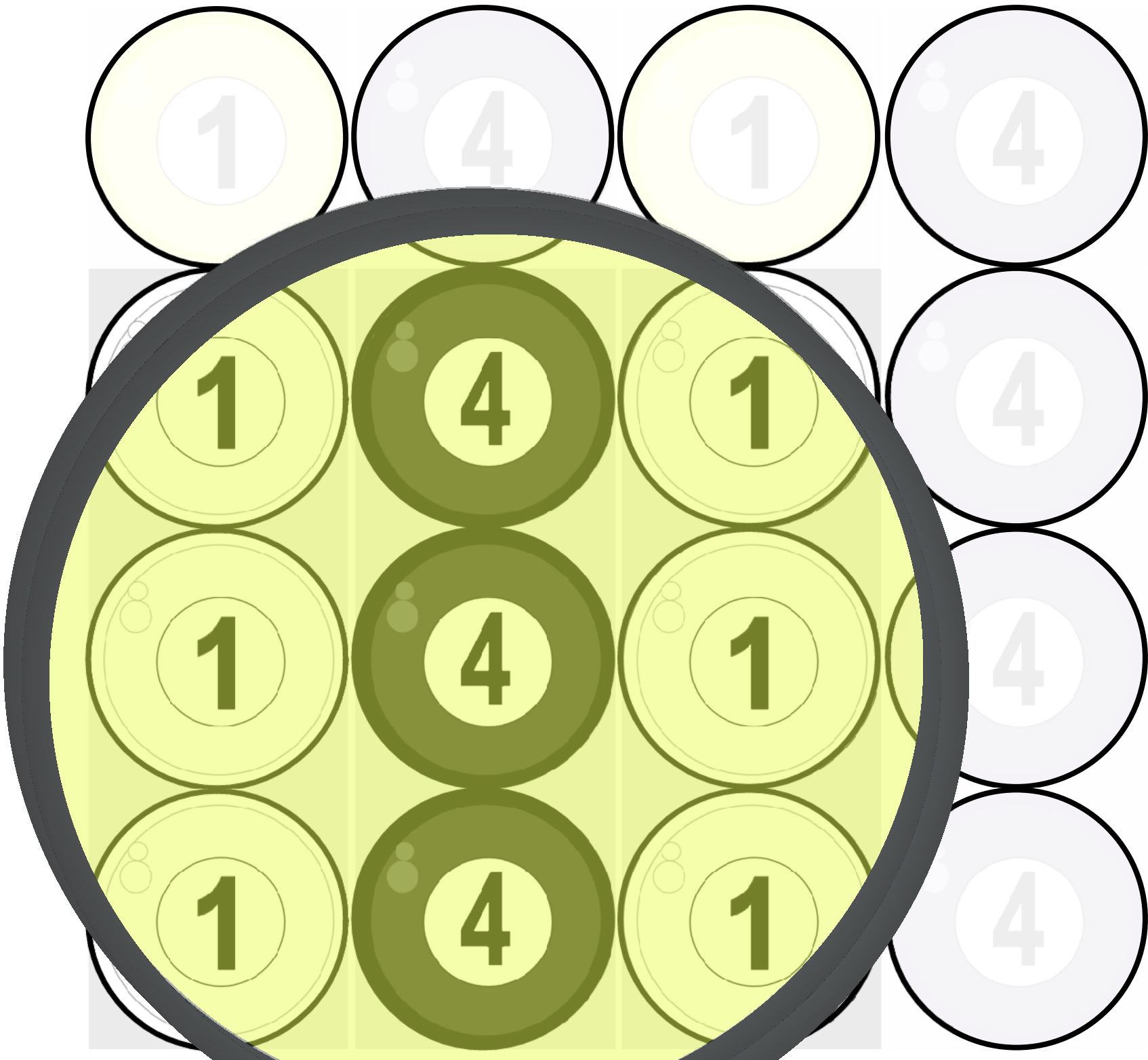


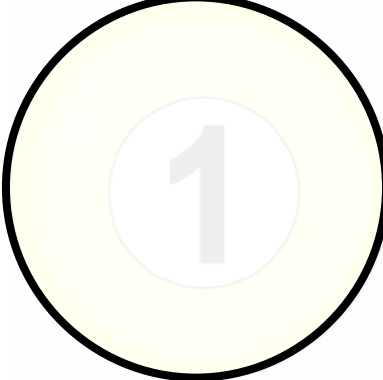
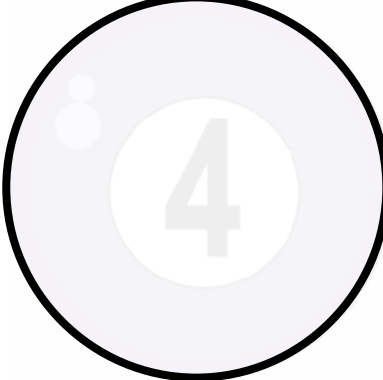
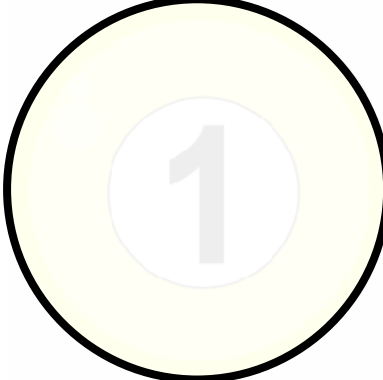
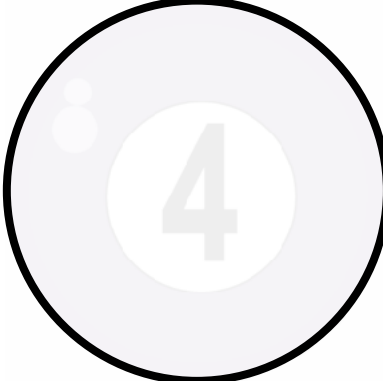
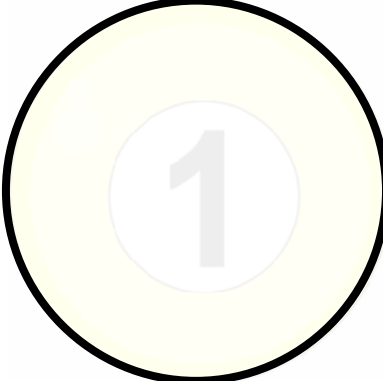
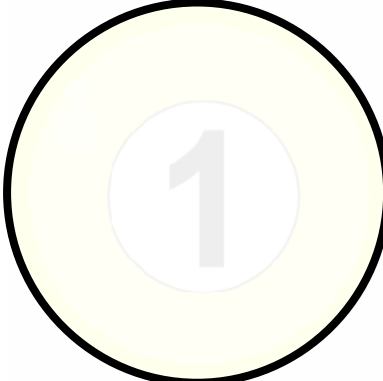
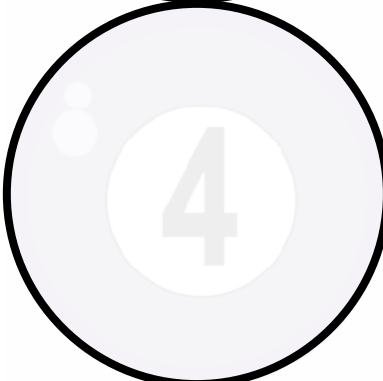
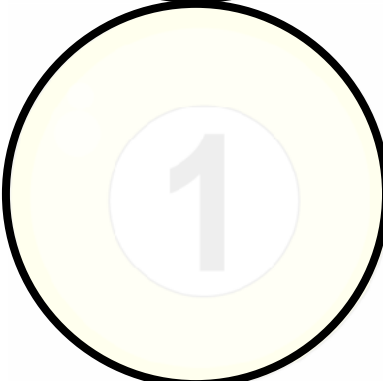
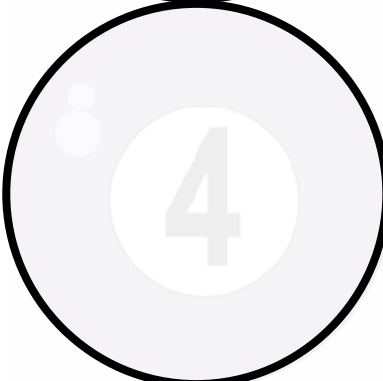
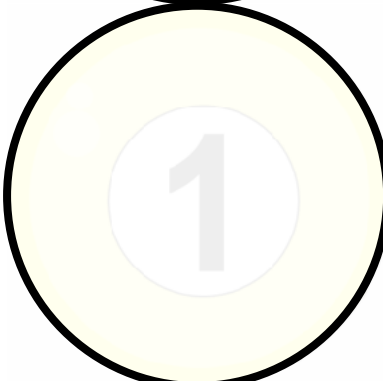
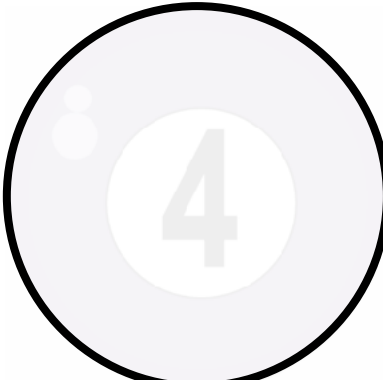
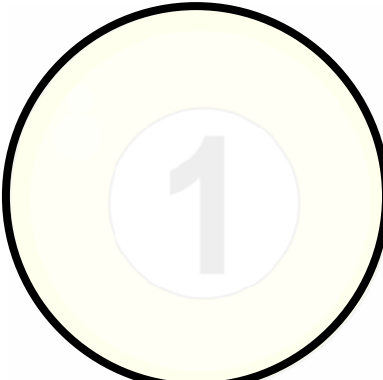
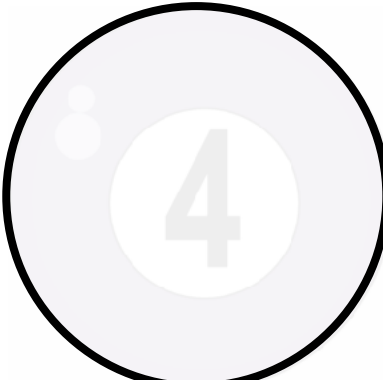
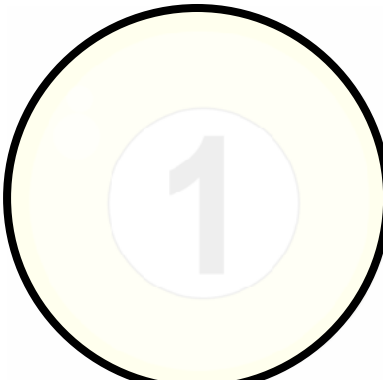
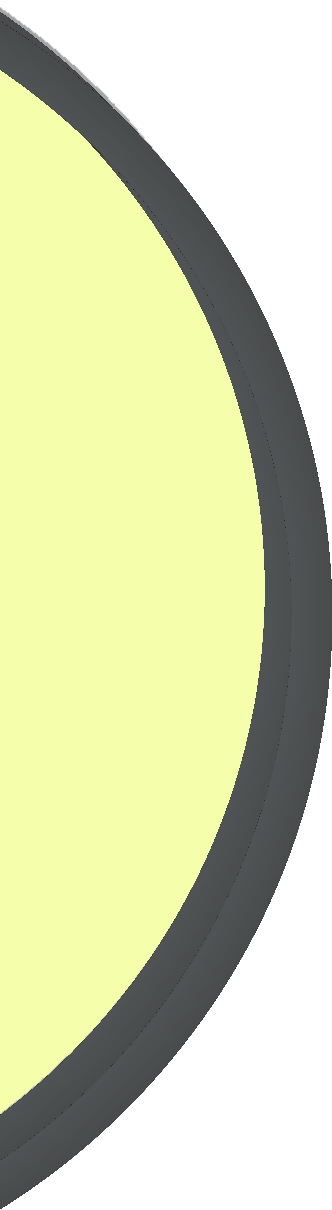


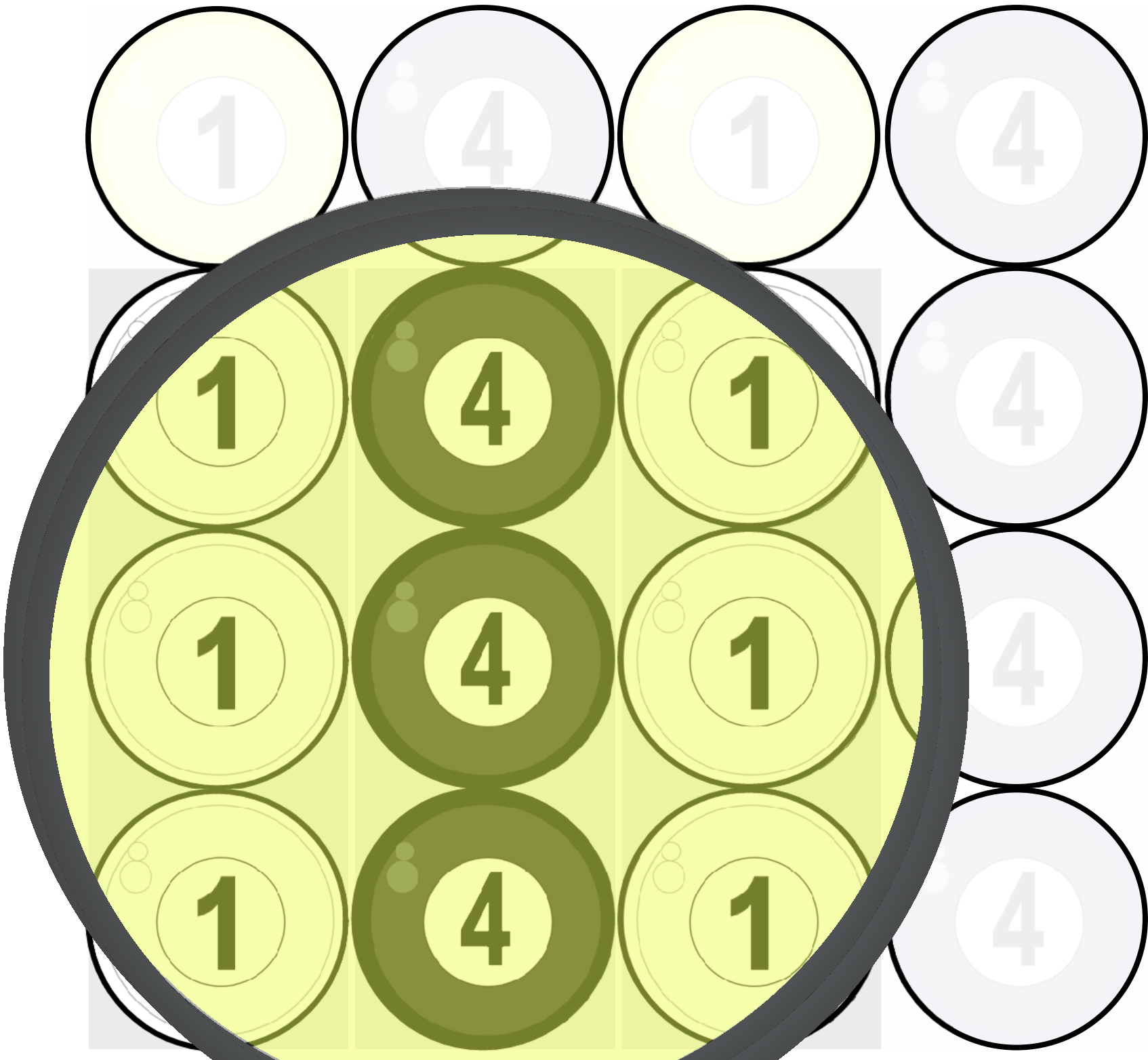


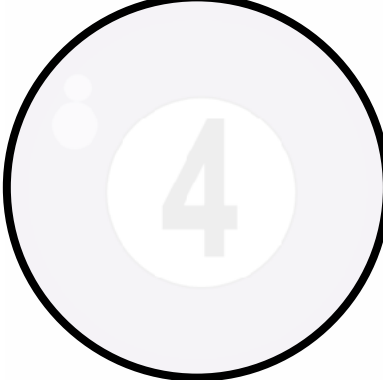
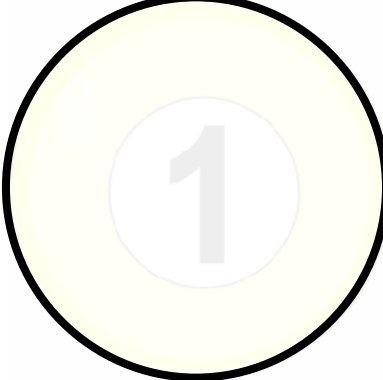
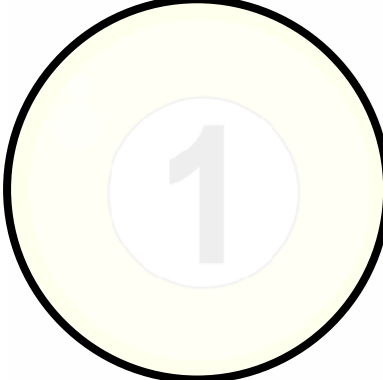
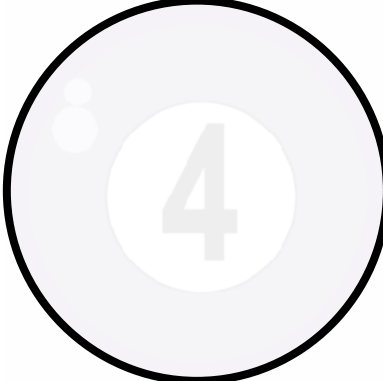
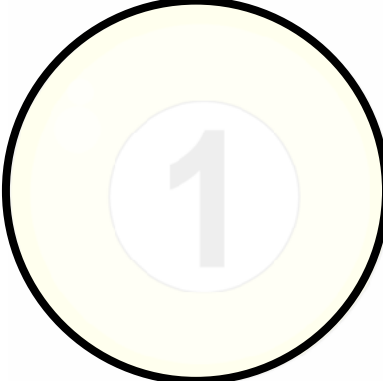
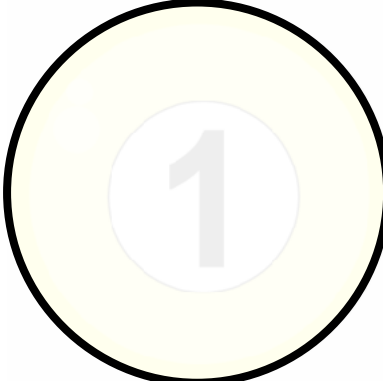
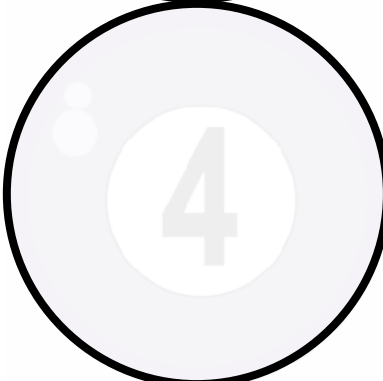
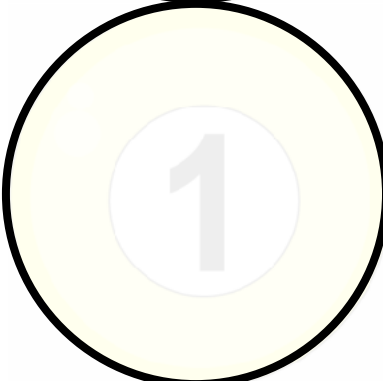
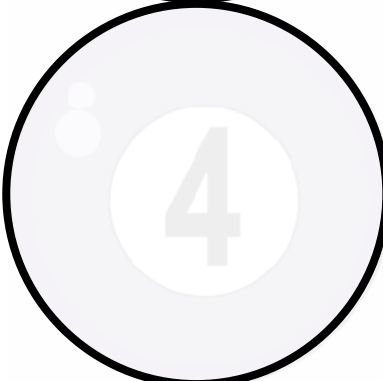
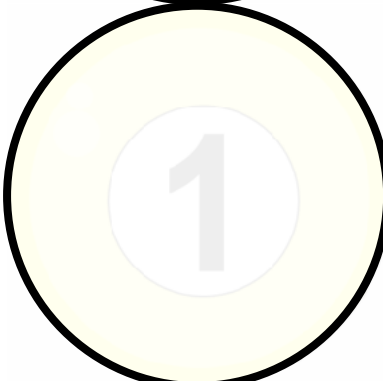
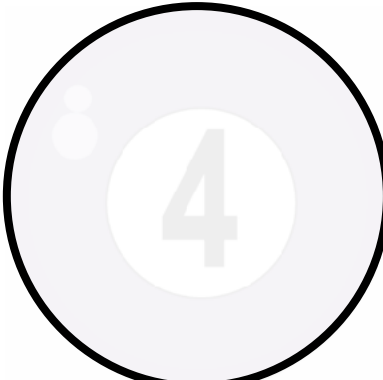
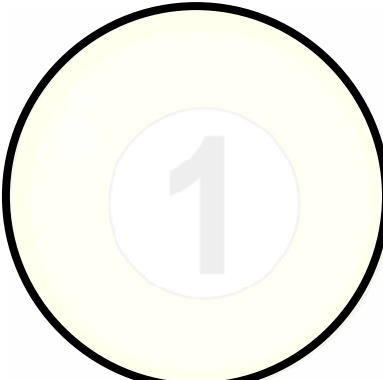
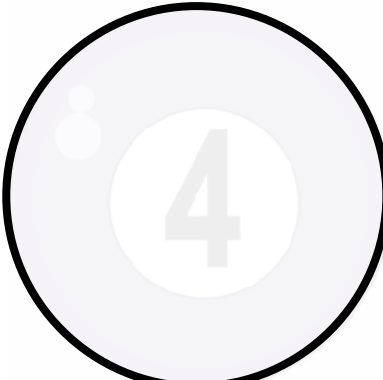
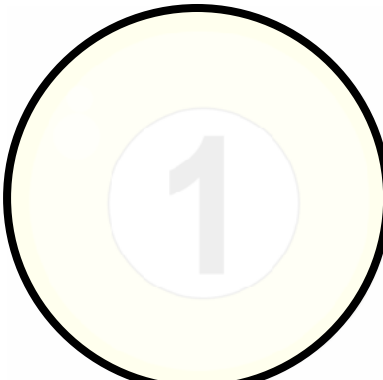
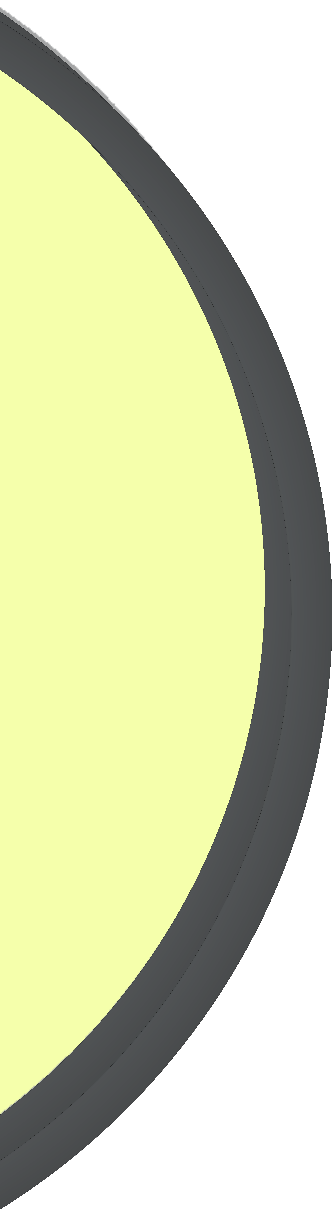
Couleurs et Filtrés:
la seule certitude est que...



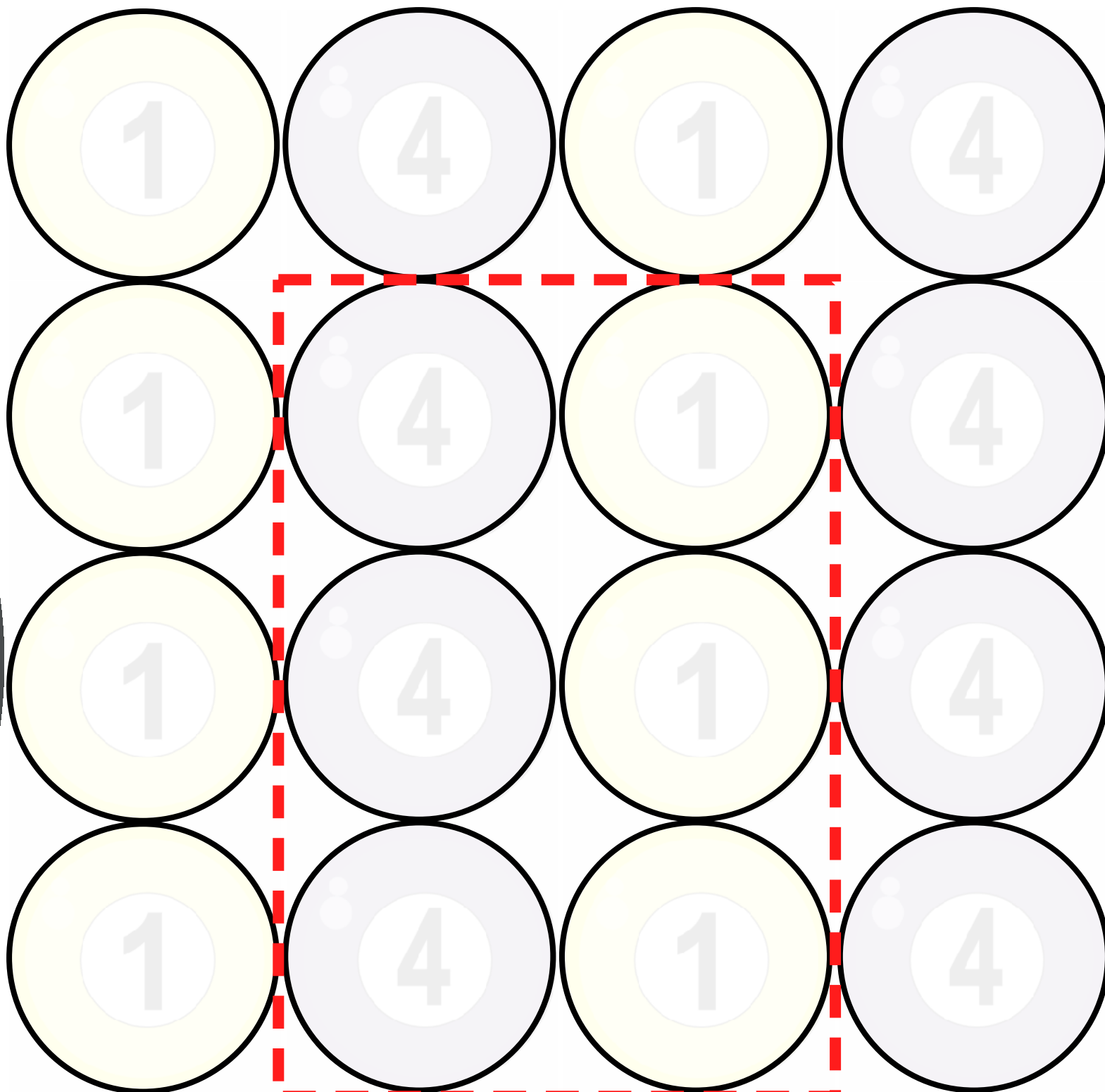
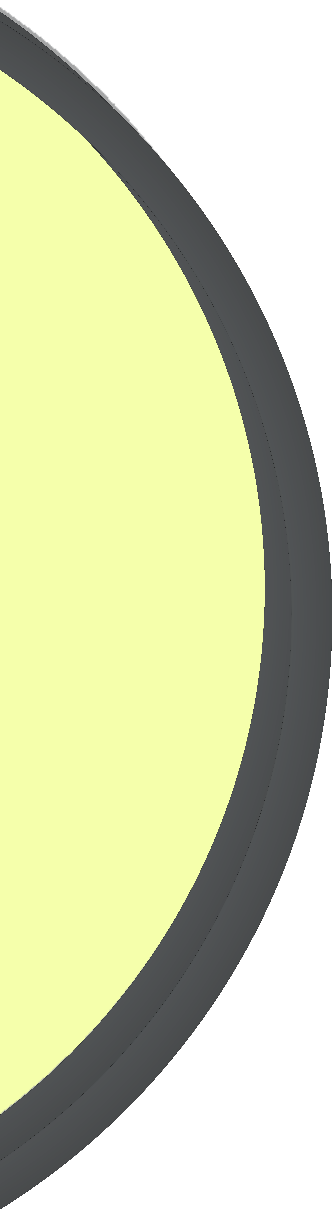


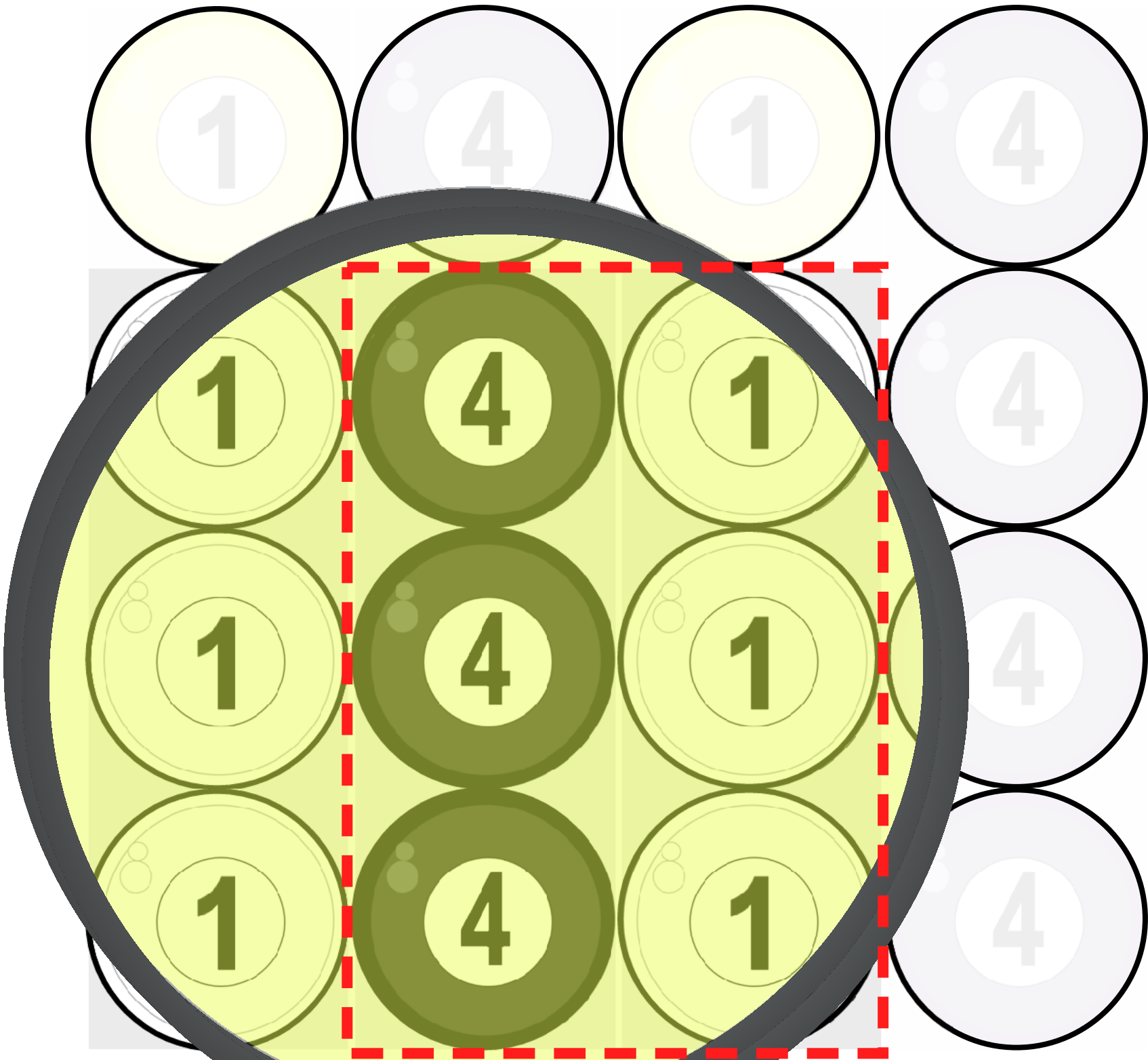


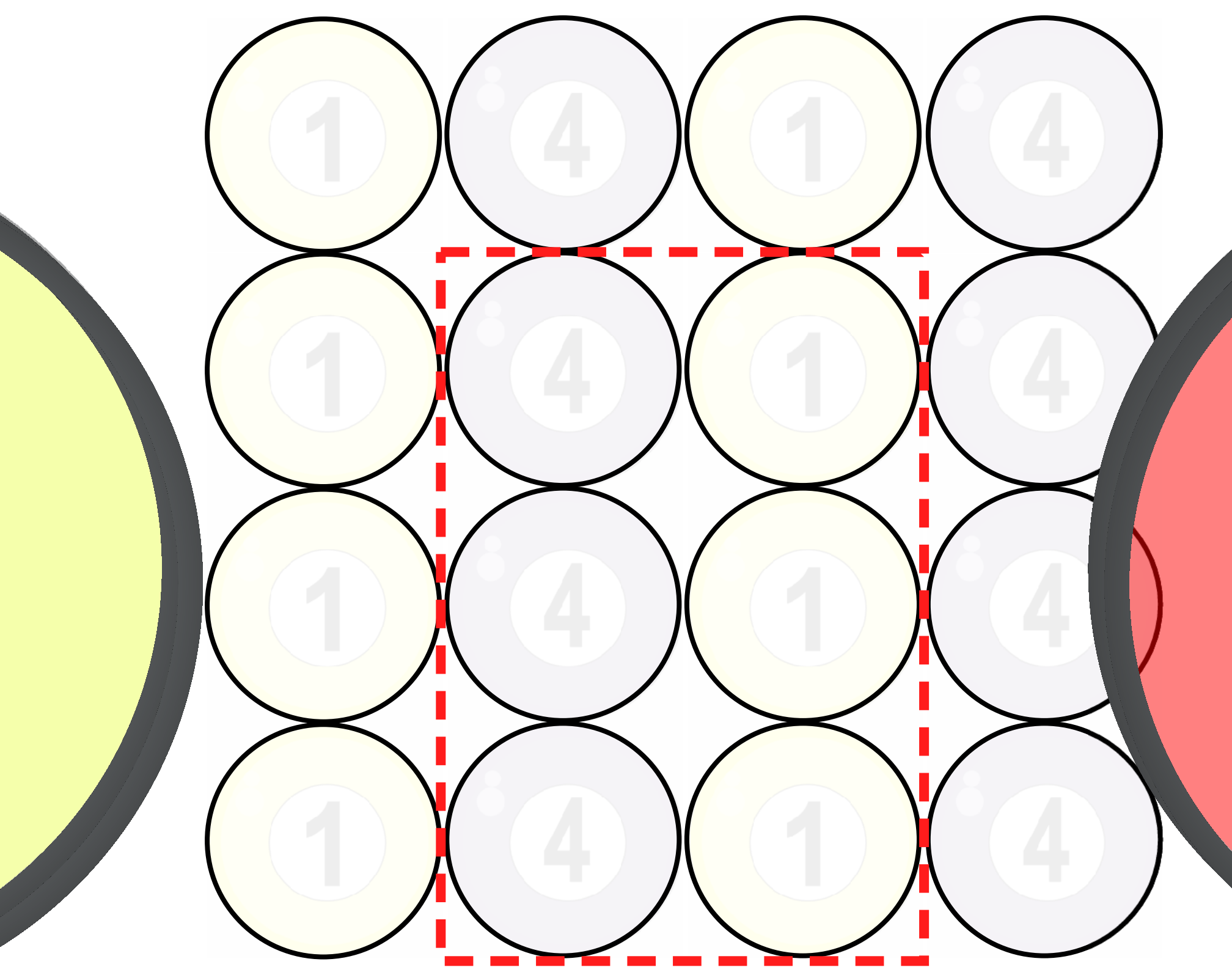


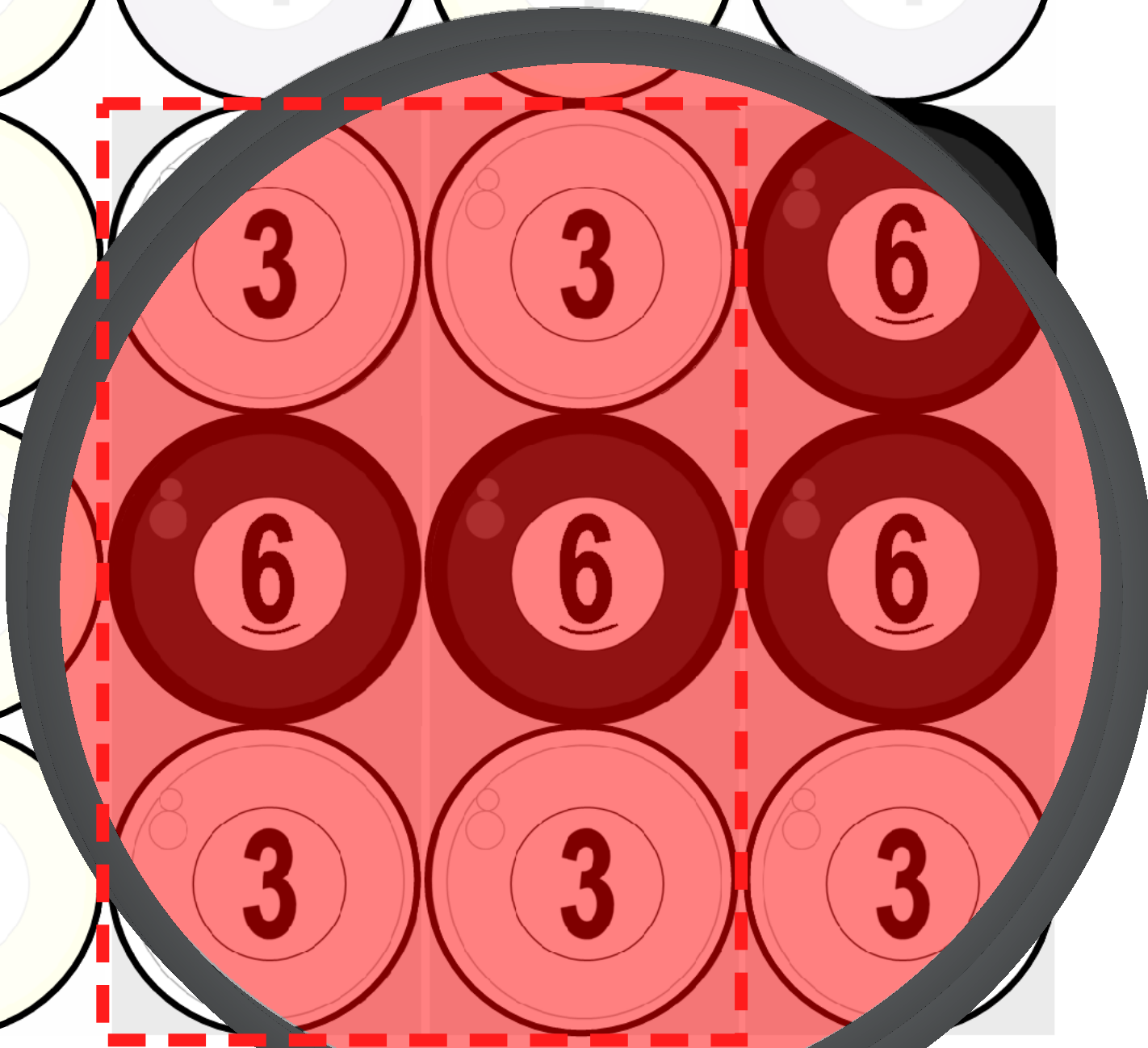
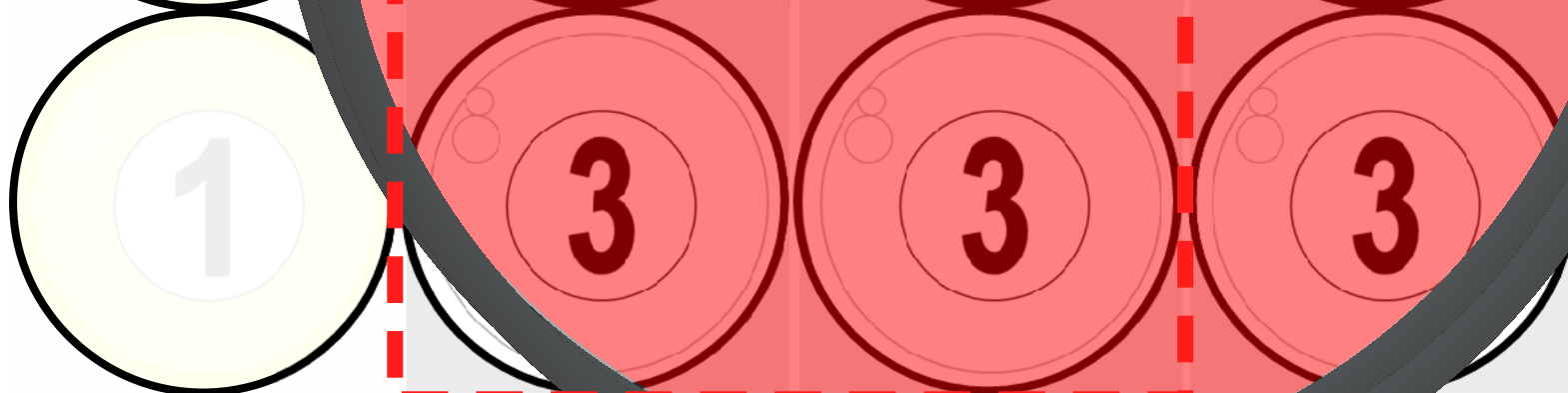
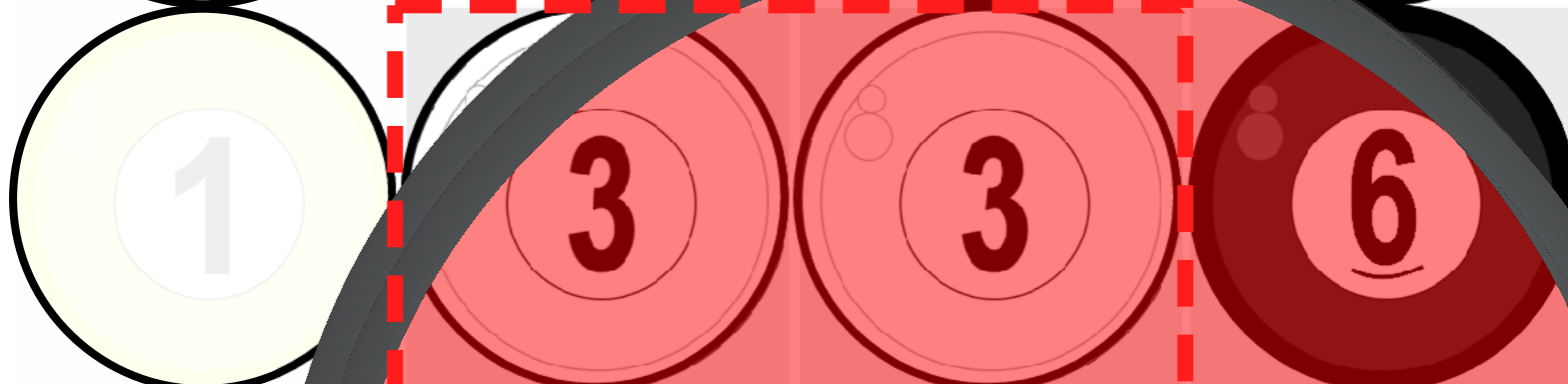
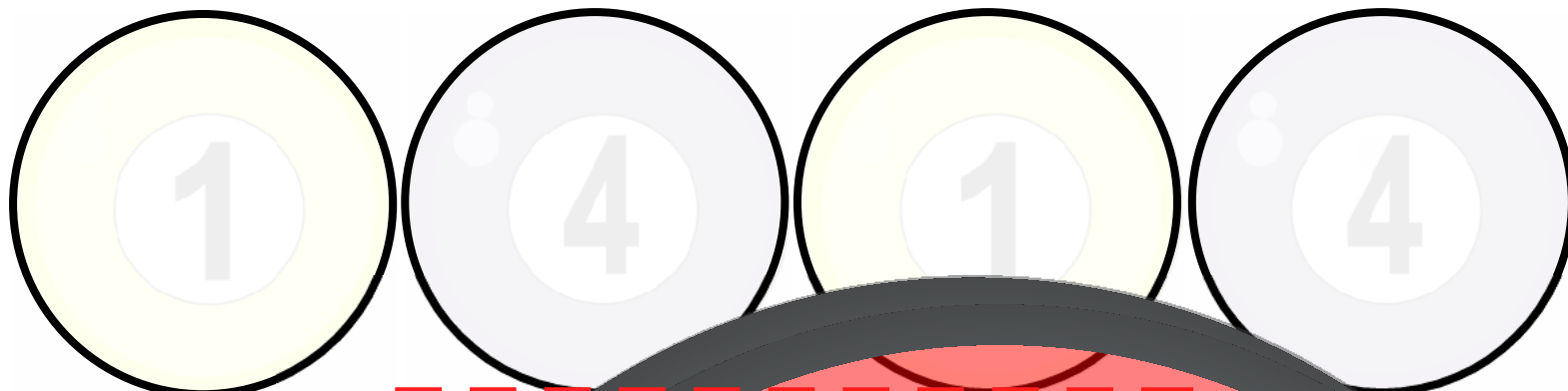


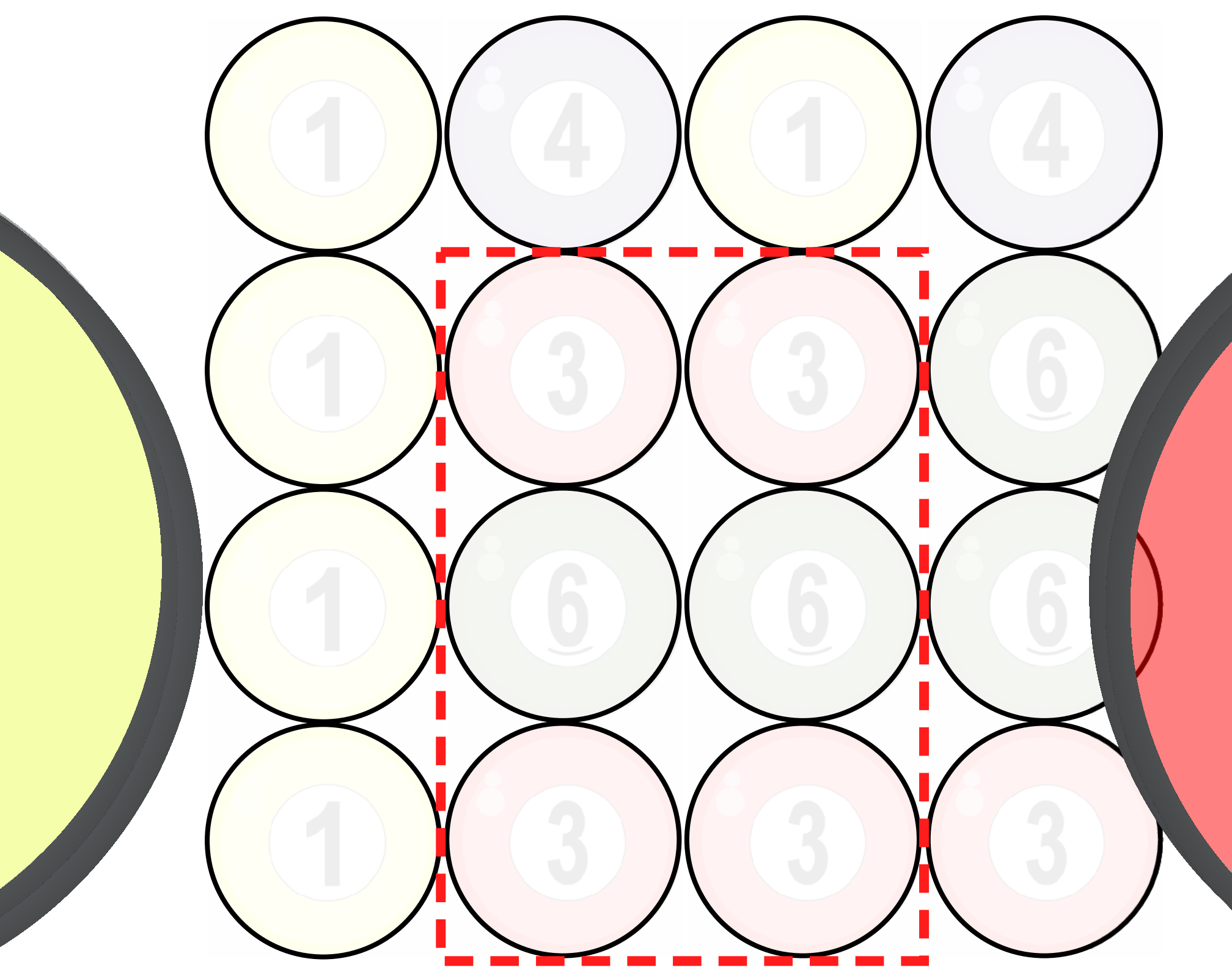
Couleurs et Filtrés:
une source d'incertitude...

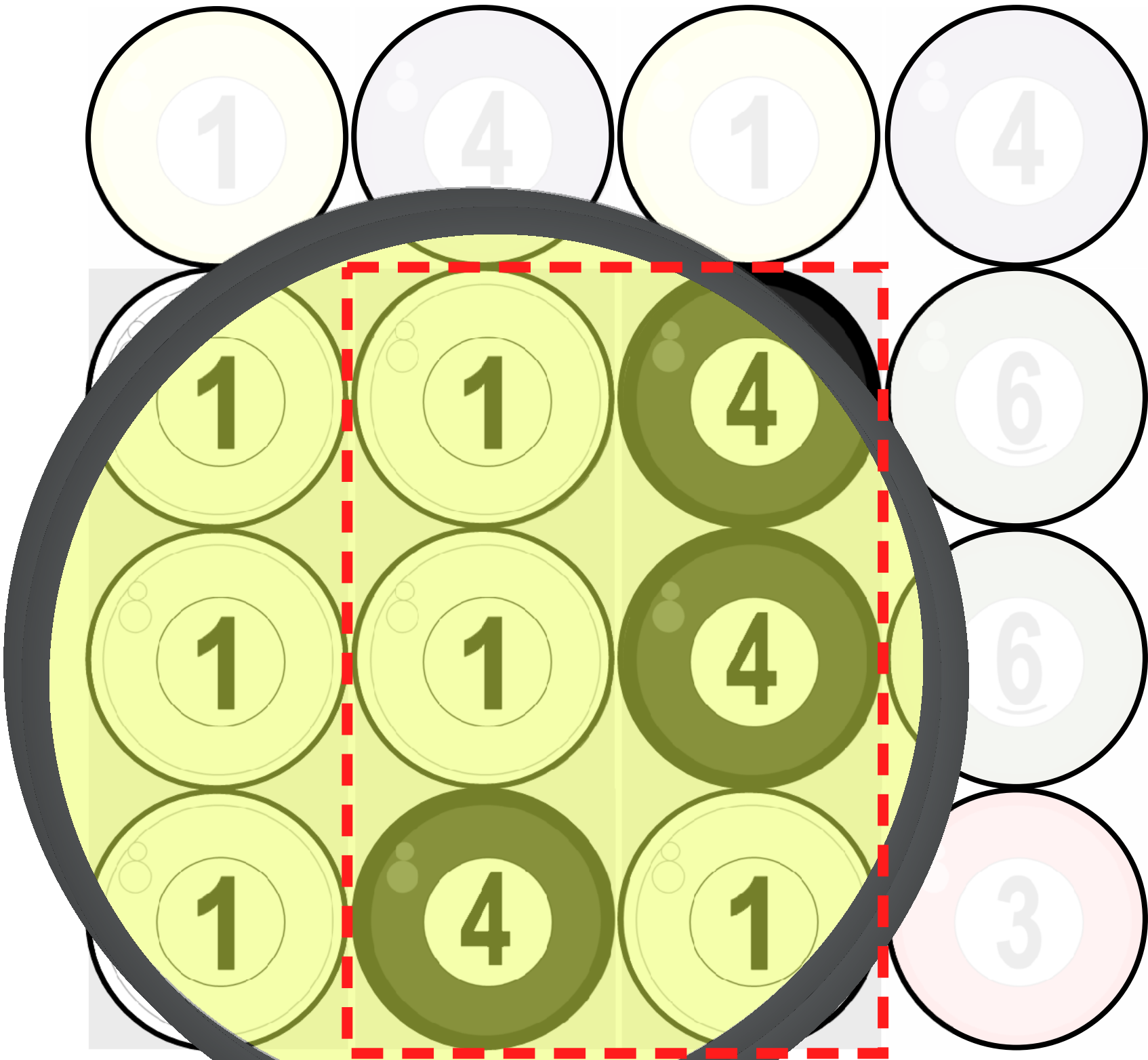


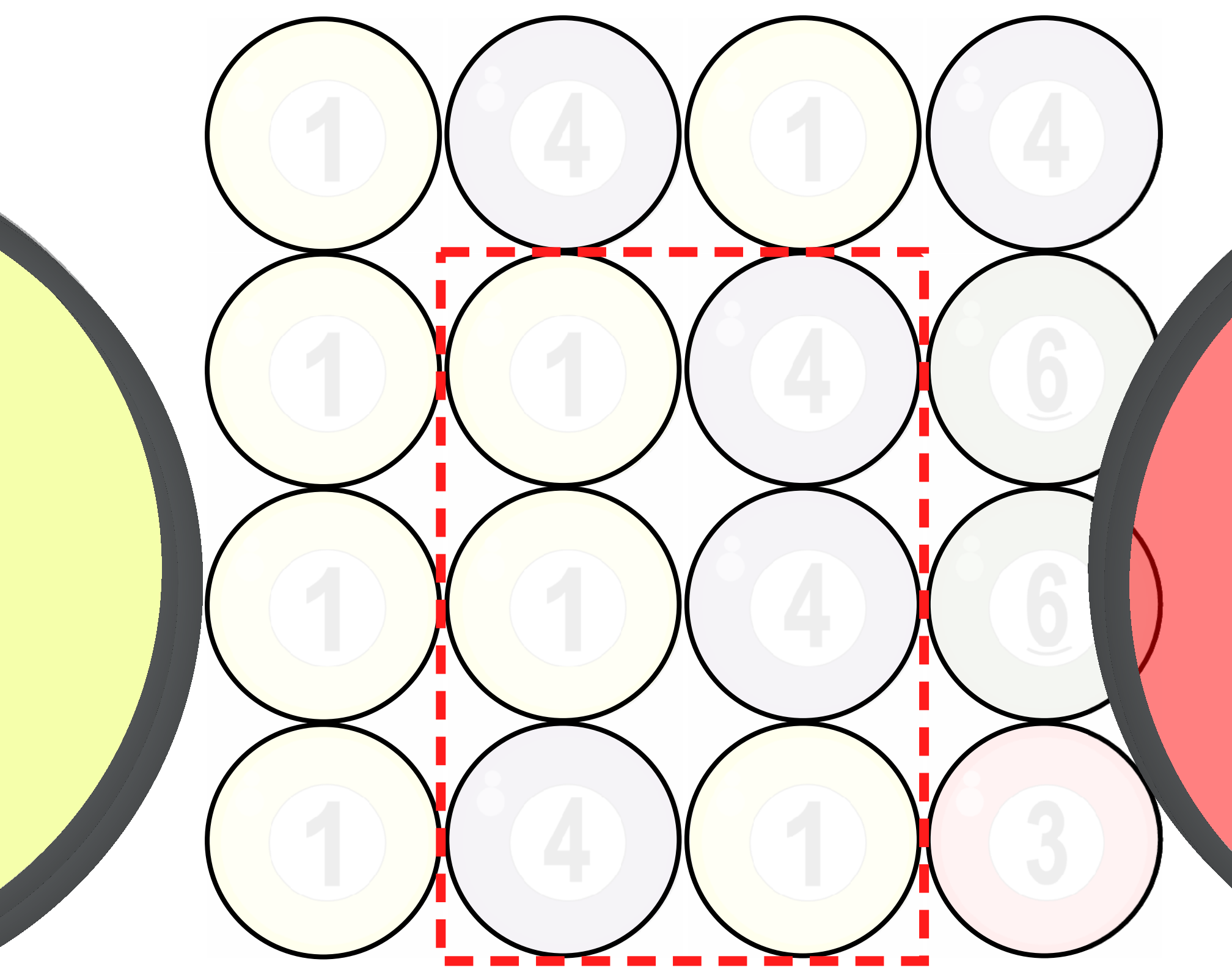


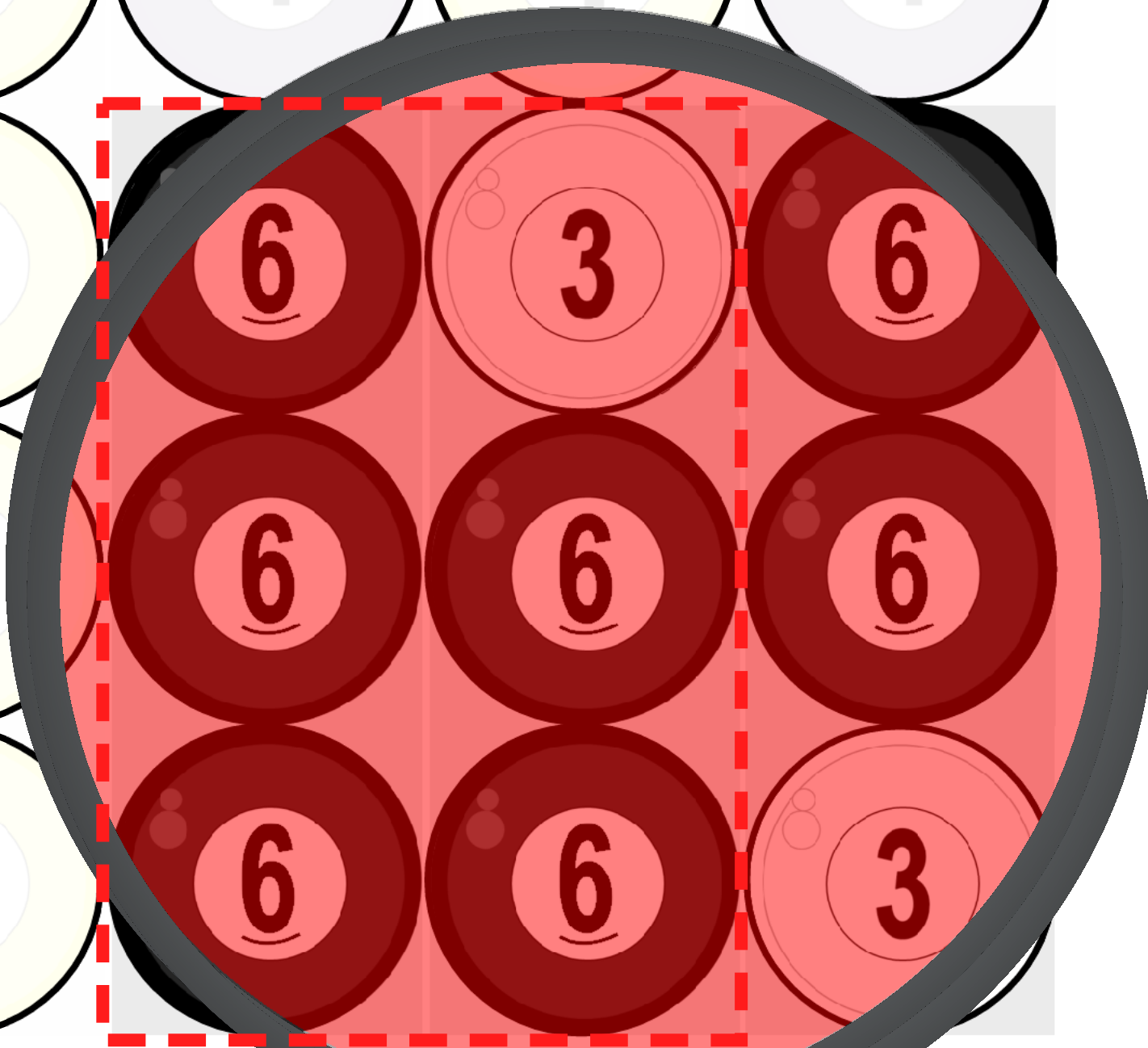
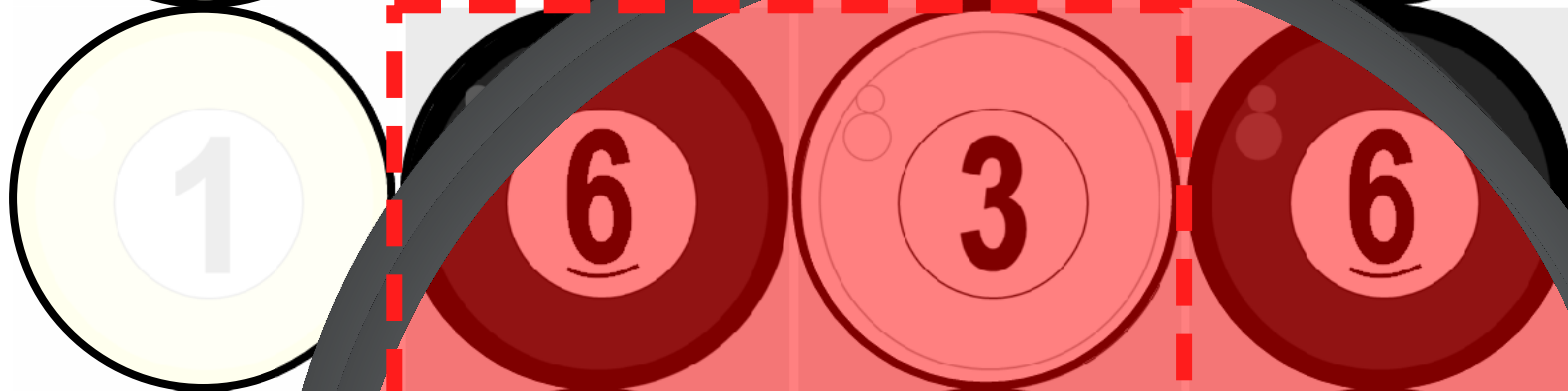














Albert Einstein

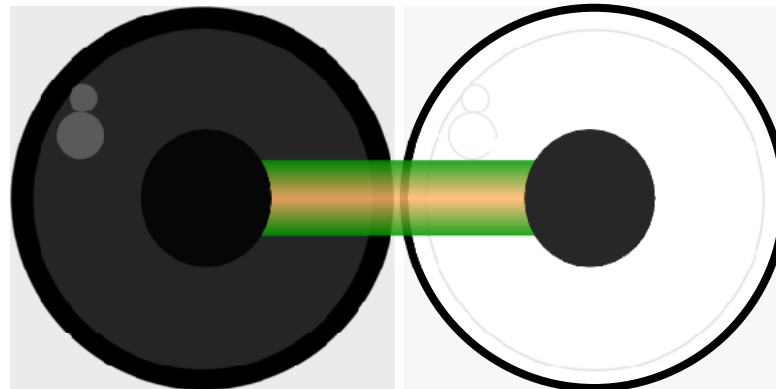


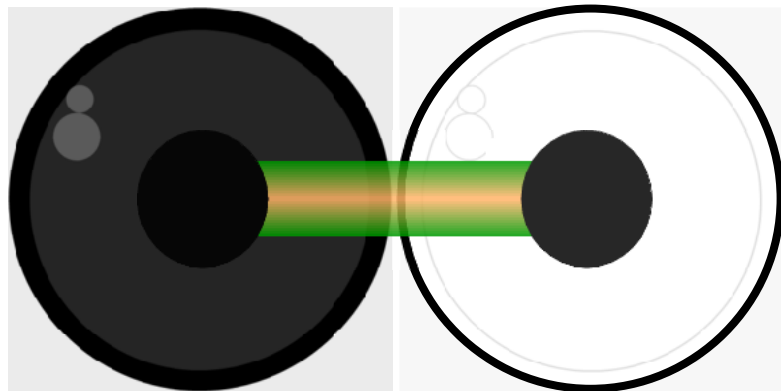
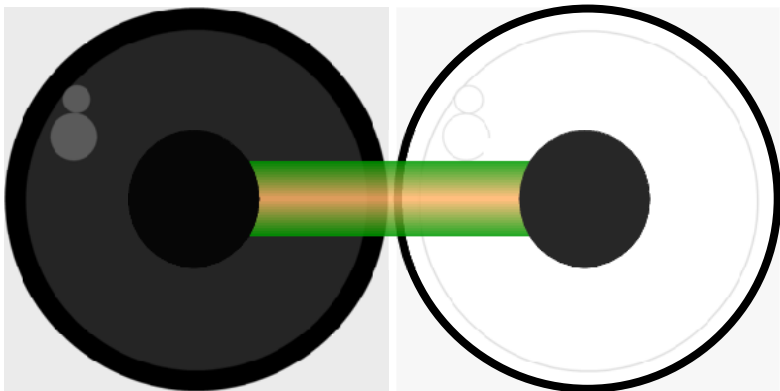
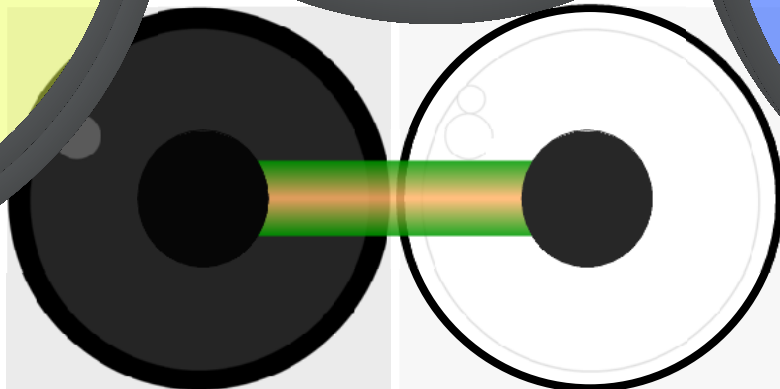
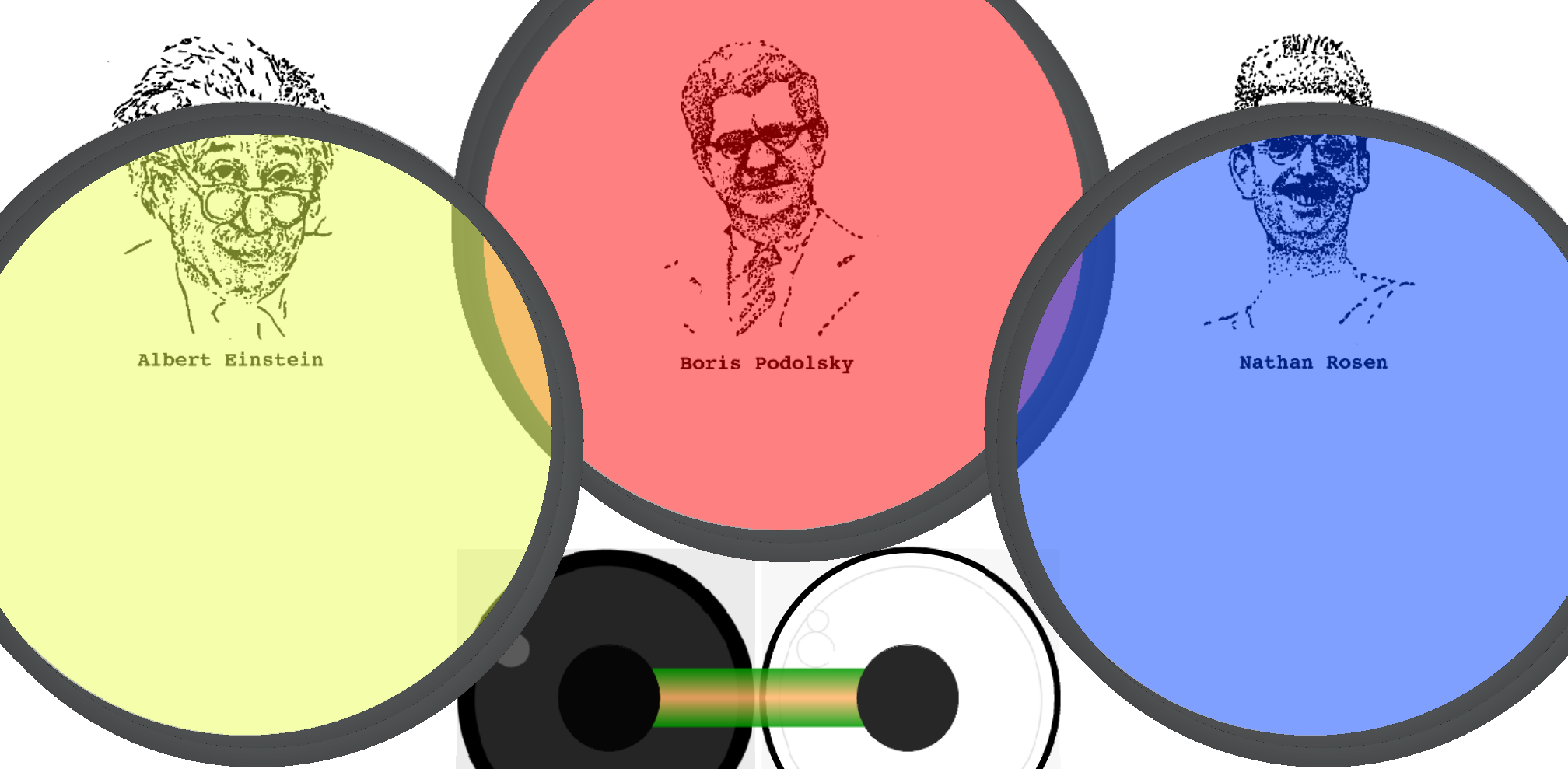
Boris Podolsky



Nathan Rosen

Paires Einstein-Podolsky-Rosen







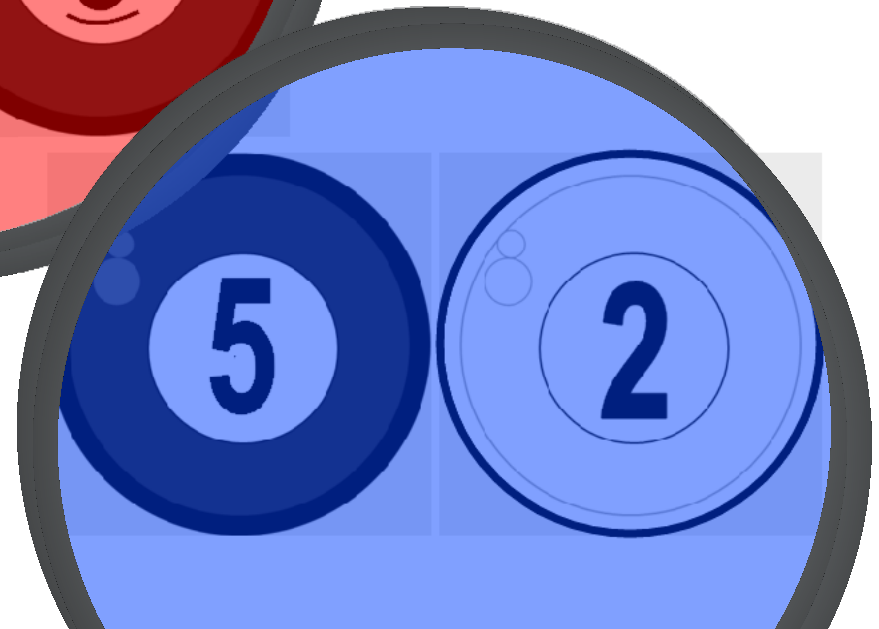
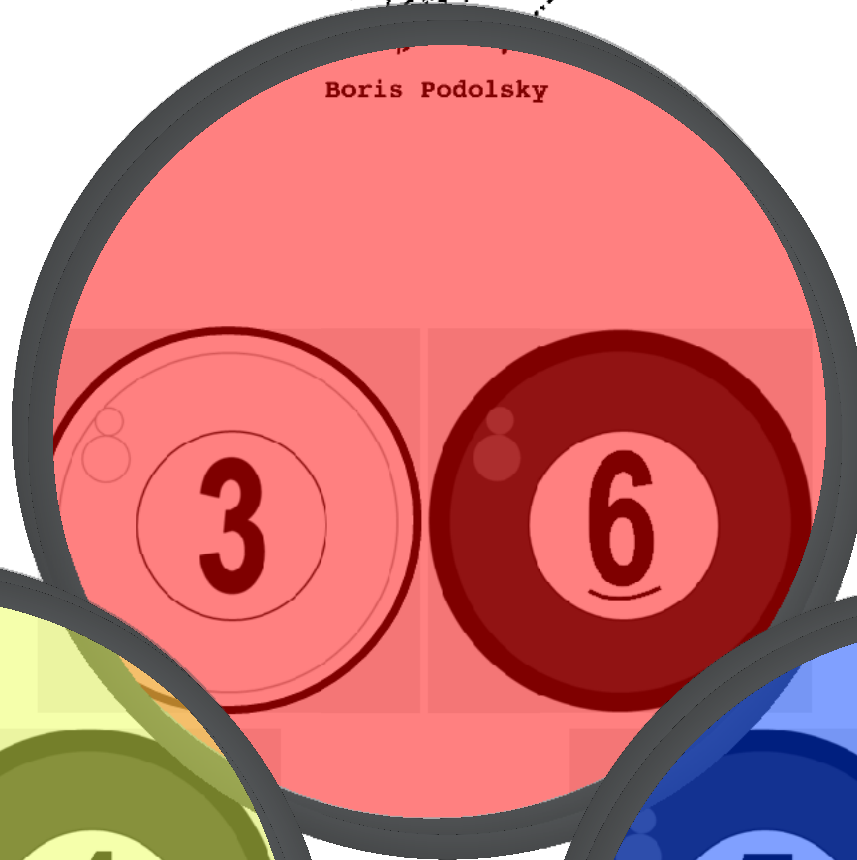
Albert Einstein



Boris Podolsky



Nathan Rosen





Albert Einstein



Boris Podolsky



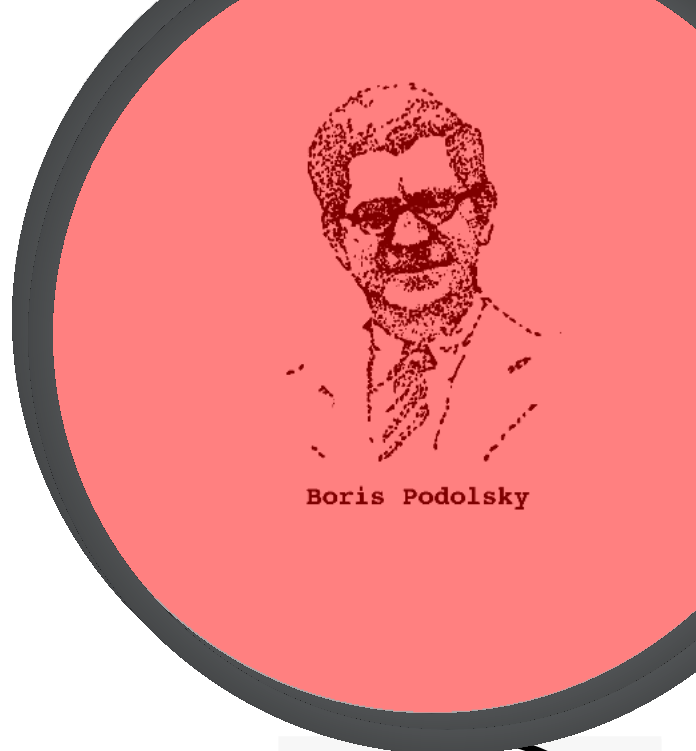
Nathan Rosen

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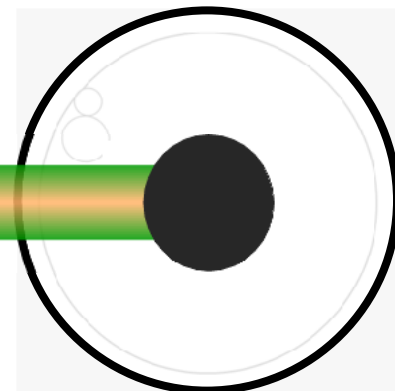
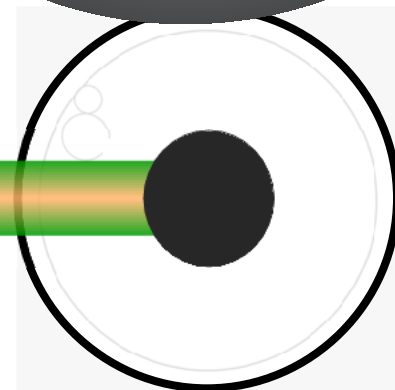
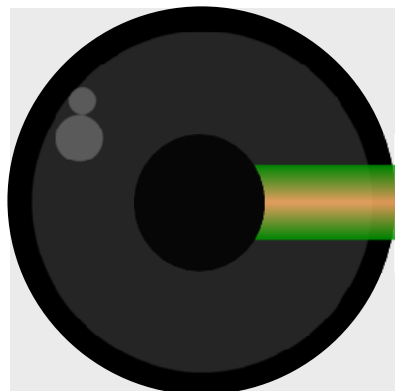
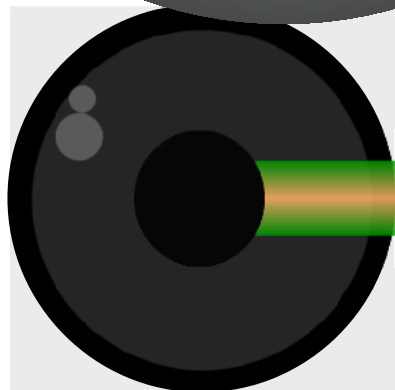
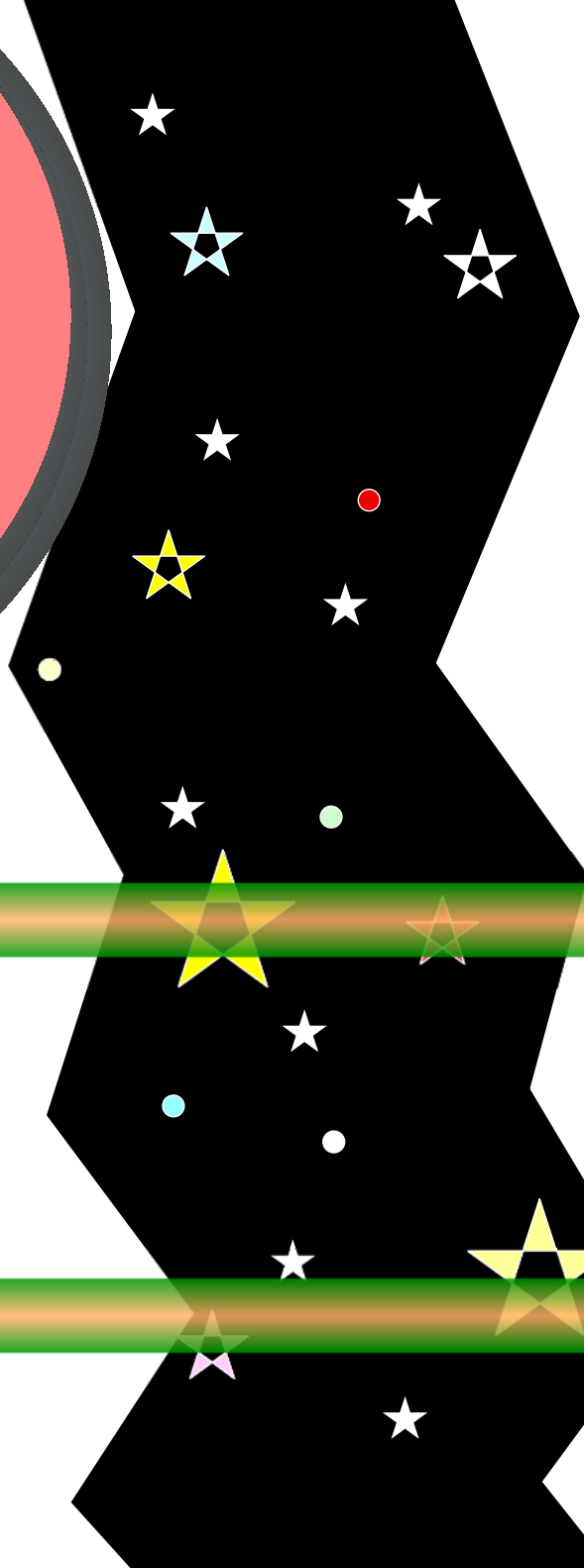
mystérieuse « action
à distance »



Albert Einstein

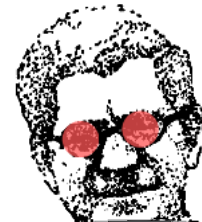


Boris Podolsky

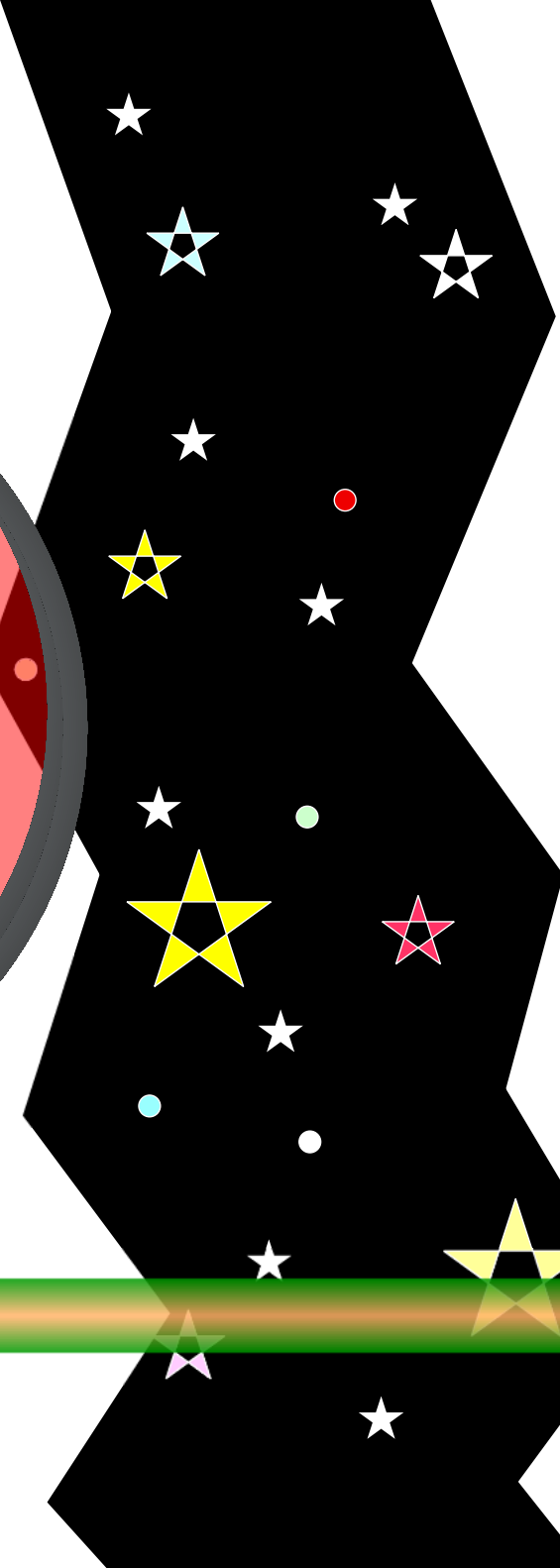
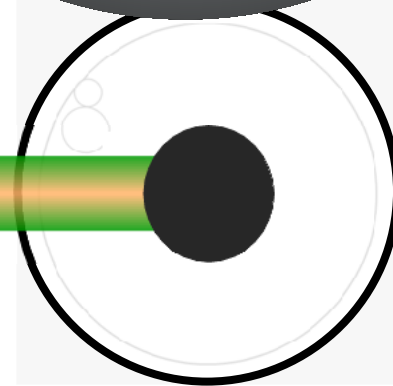
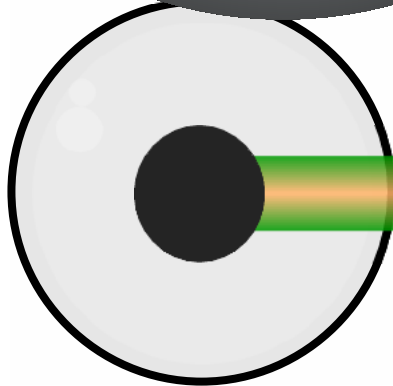




Albert Einstein



Boris Podolsky

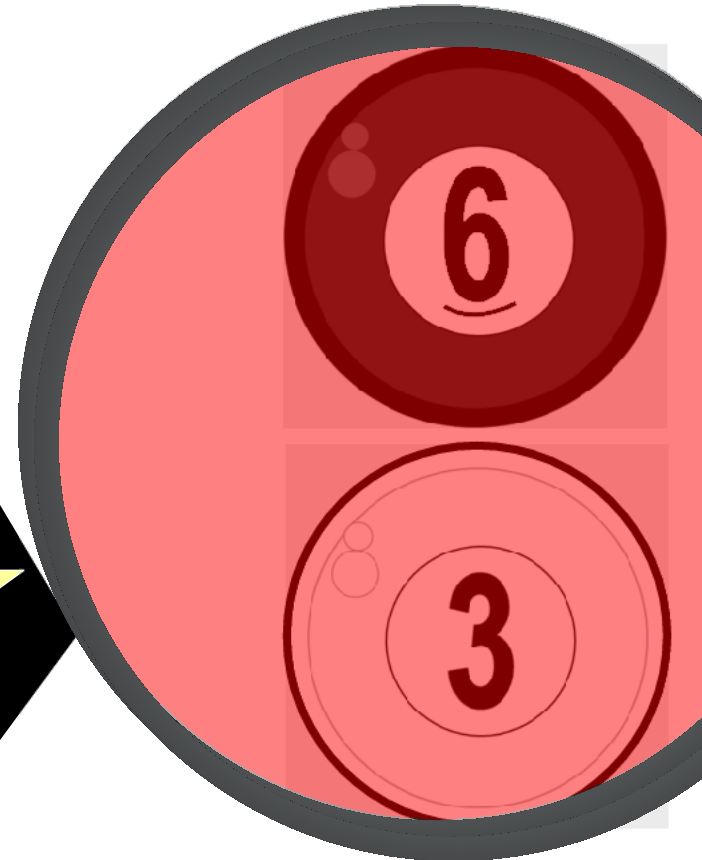
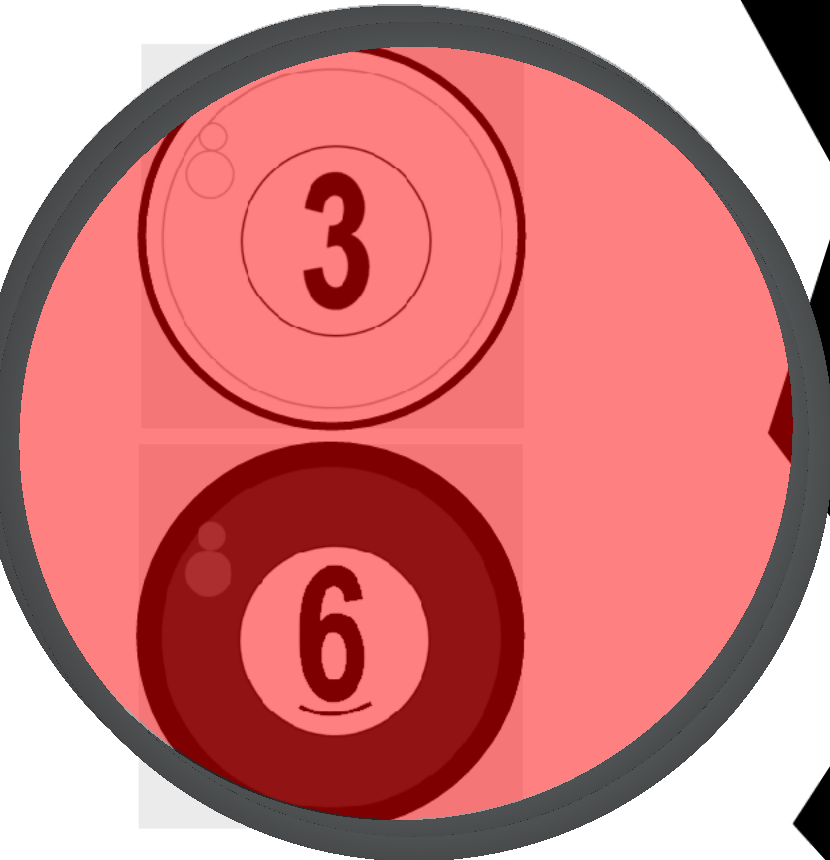




Albert Einstein



Boris Podolsky

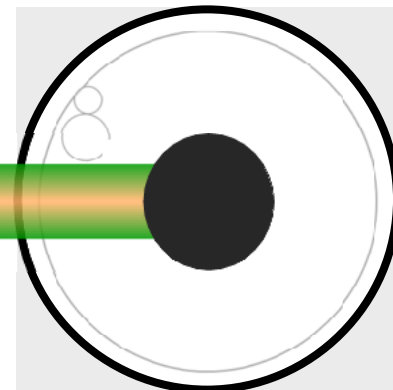
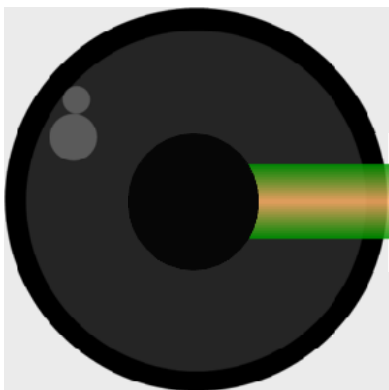
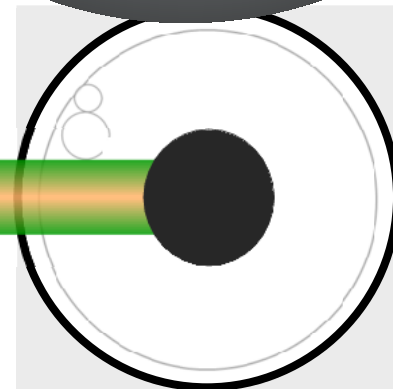
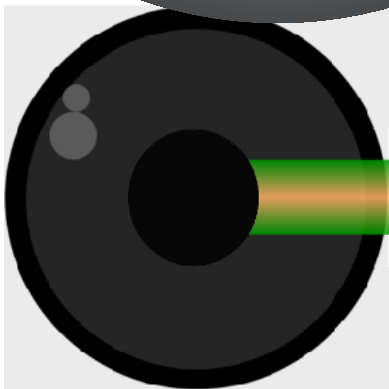
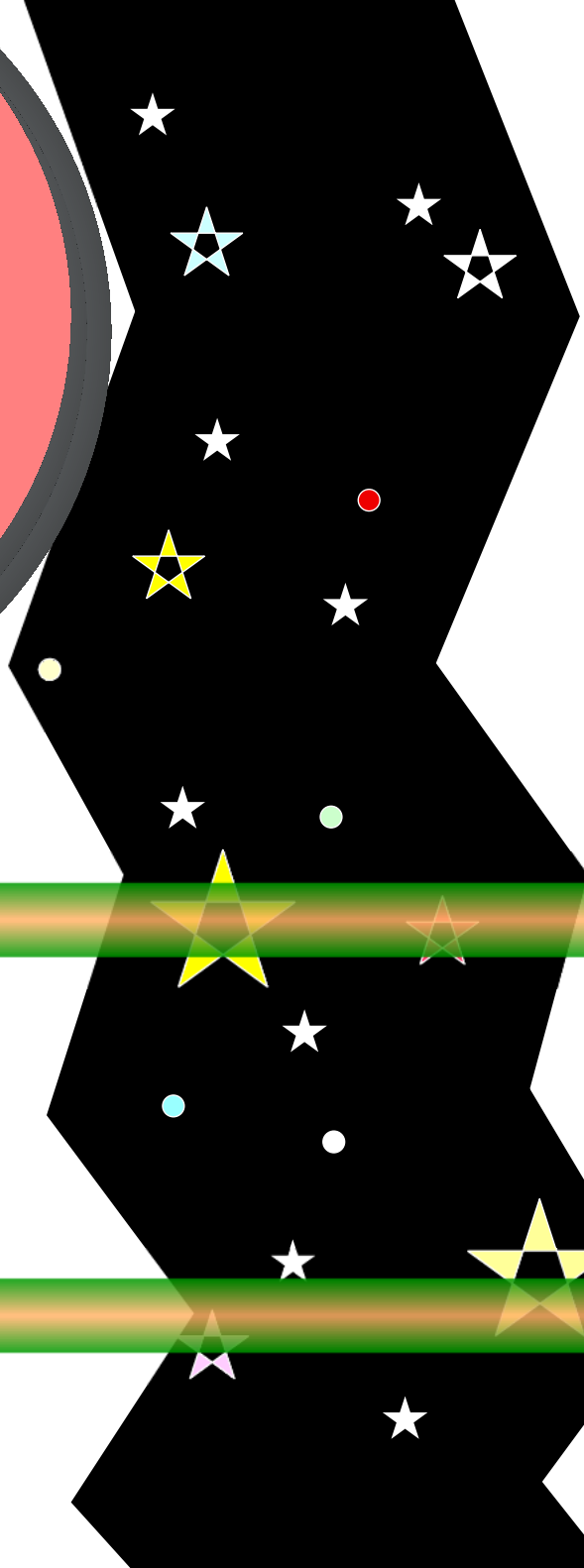




Albert Einstein

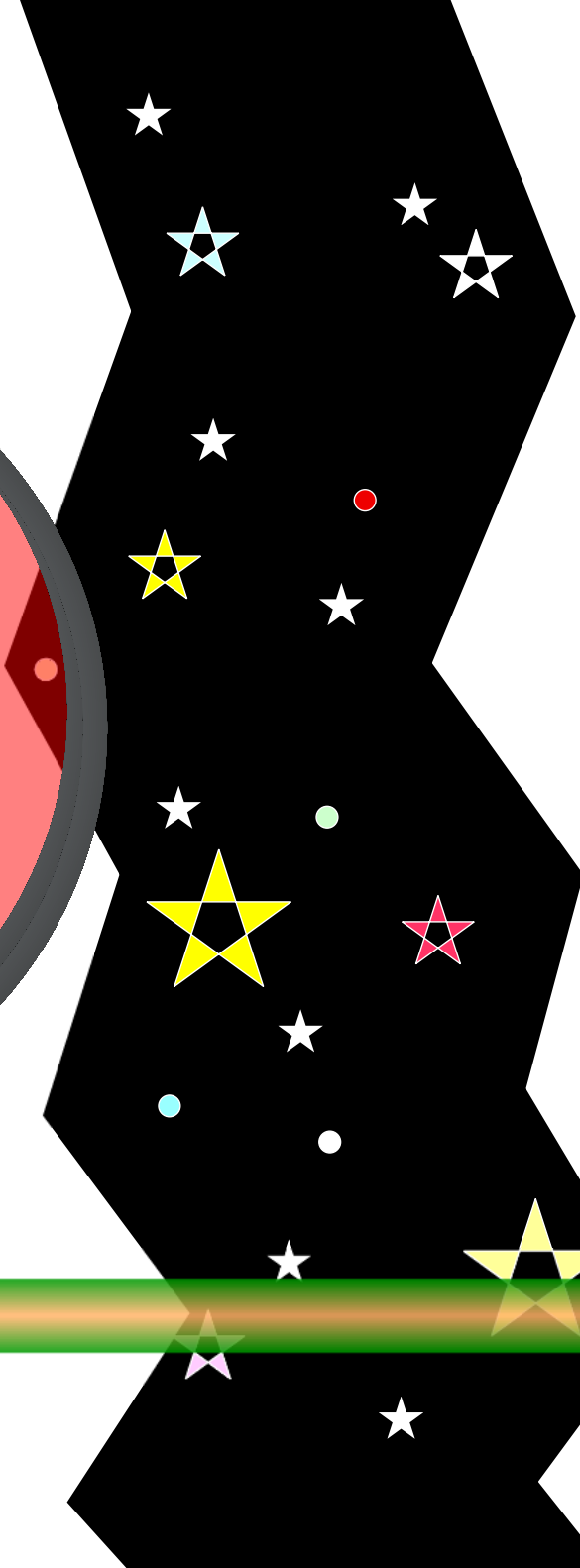
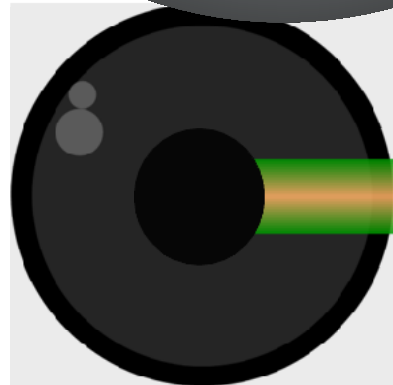


Boris Podolsky

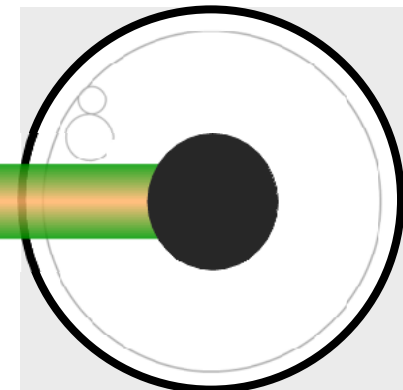




Albert Einstein



Boris Podolsky

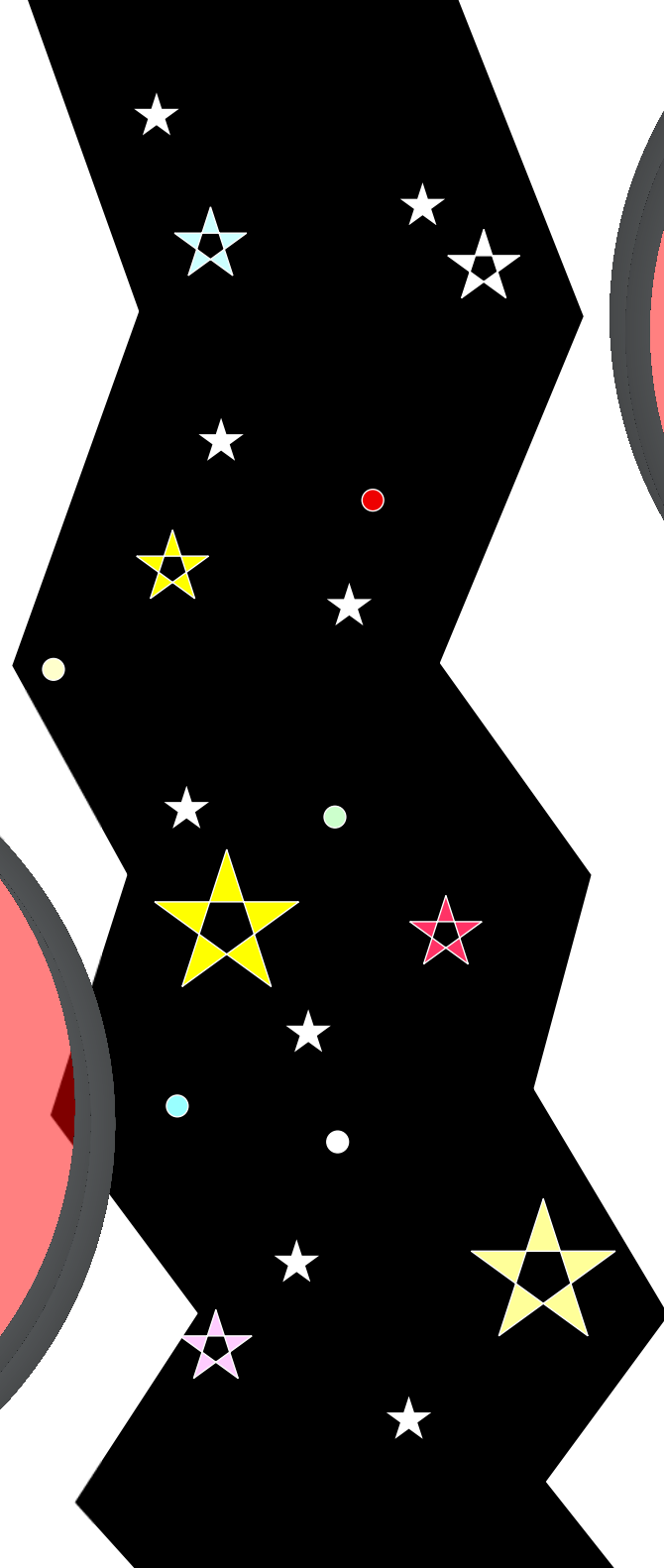
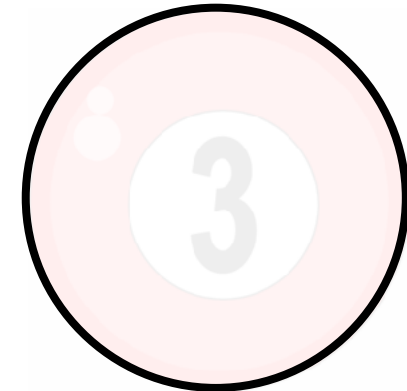
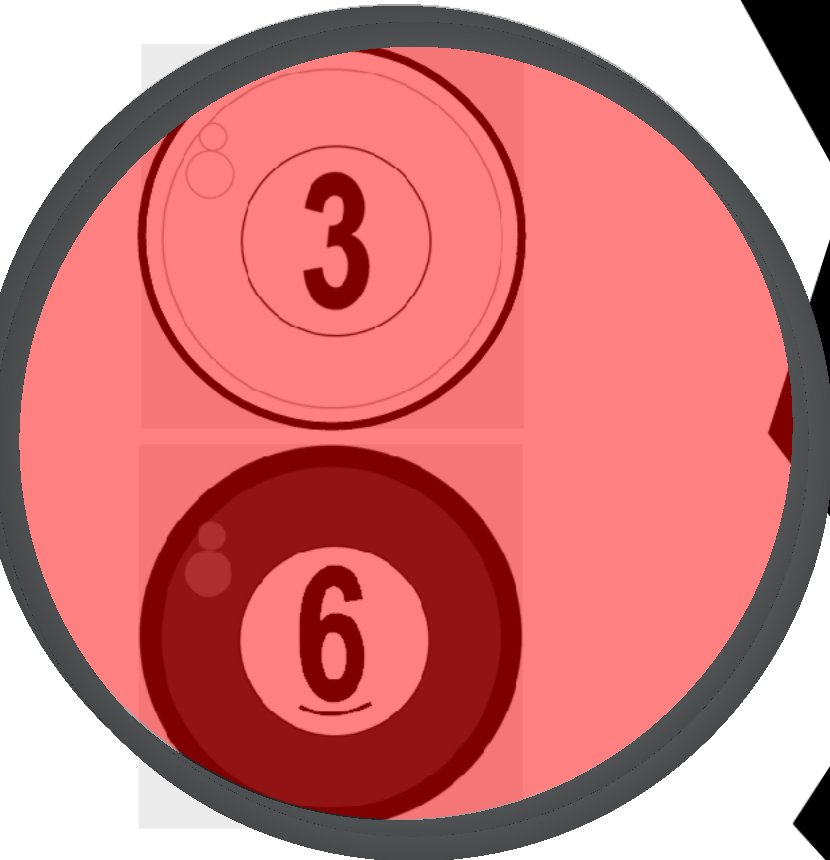




Albert Einstein



Boris Podolsky

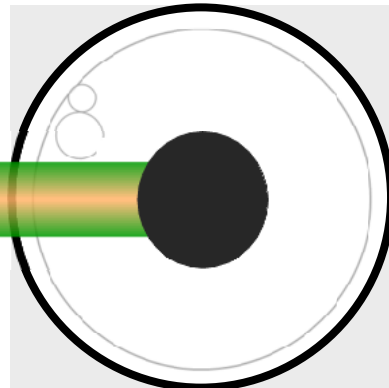
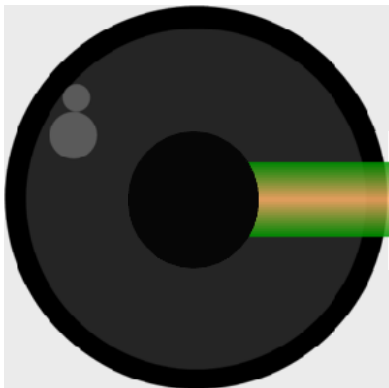
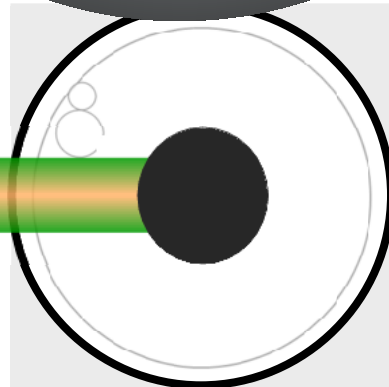
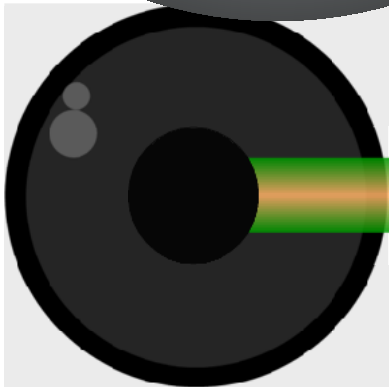
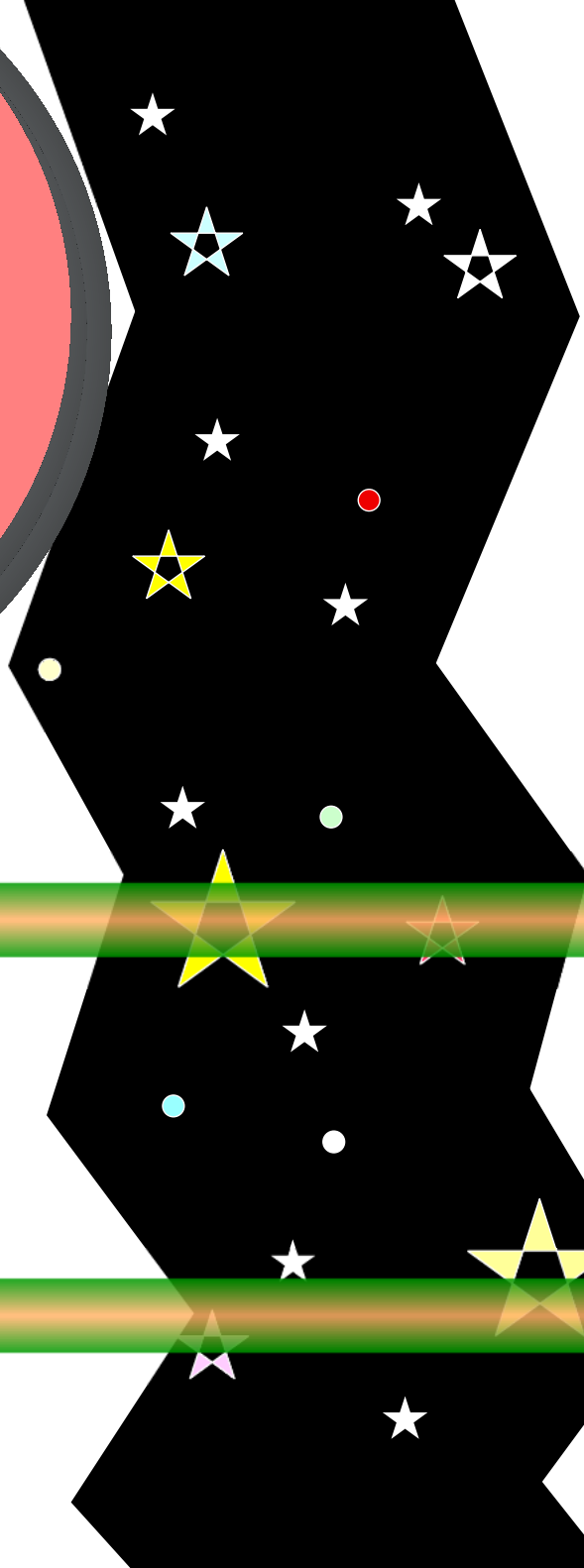


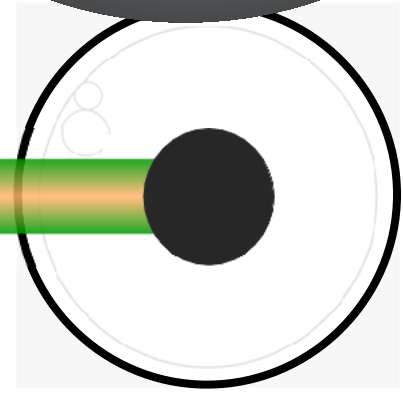
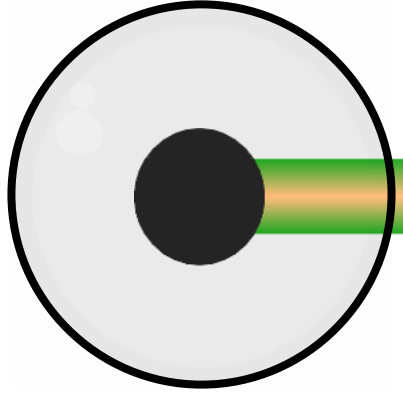


Albert Einstein



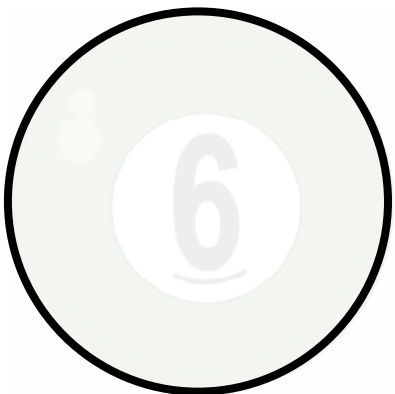
Boris Podolsky



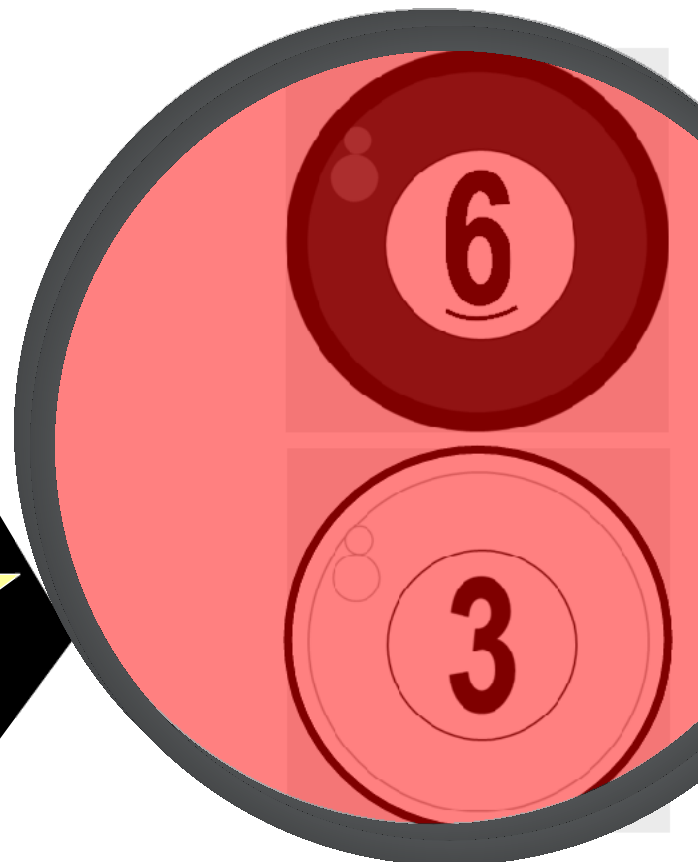




Albert Einstein

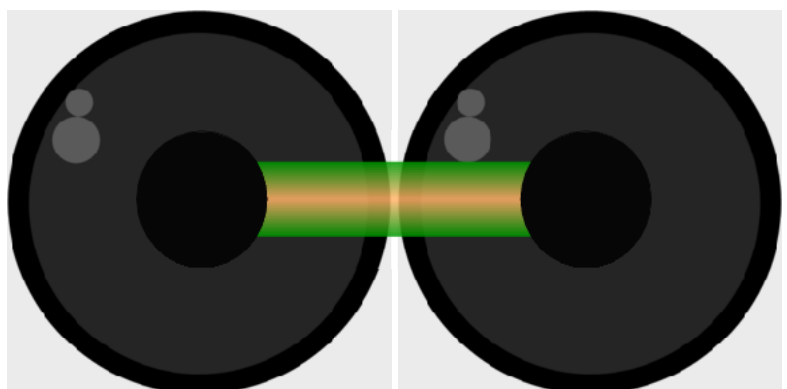
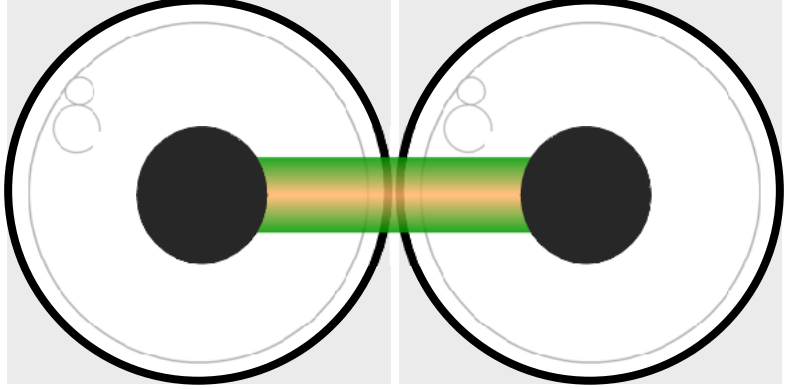
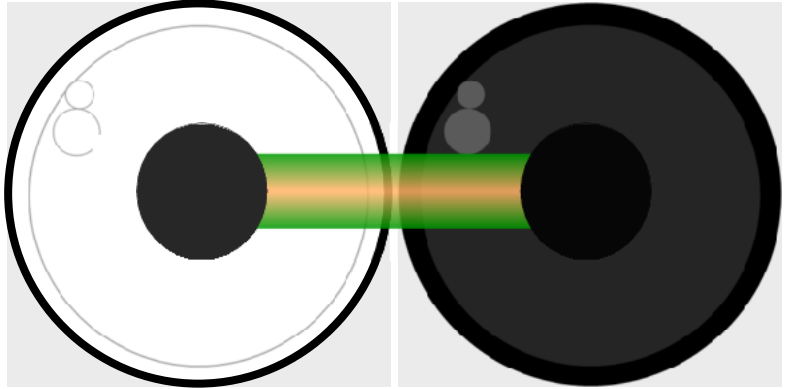
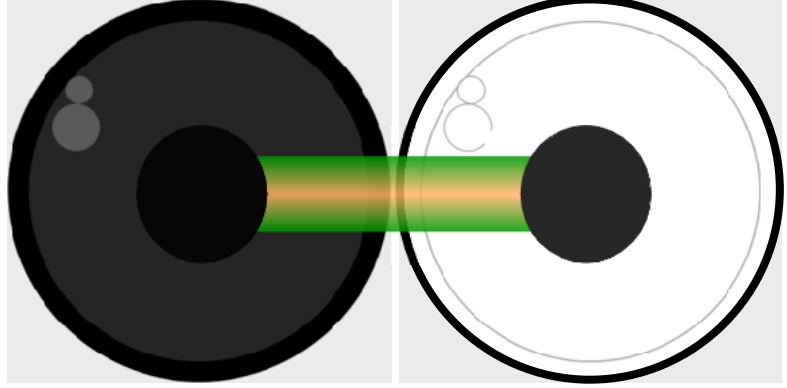


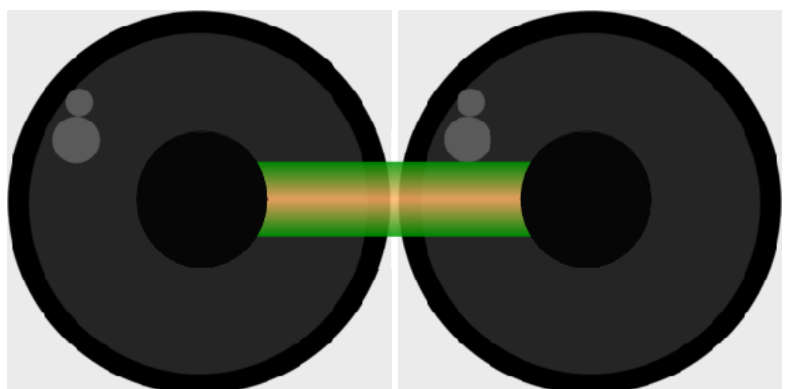
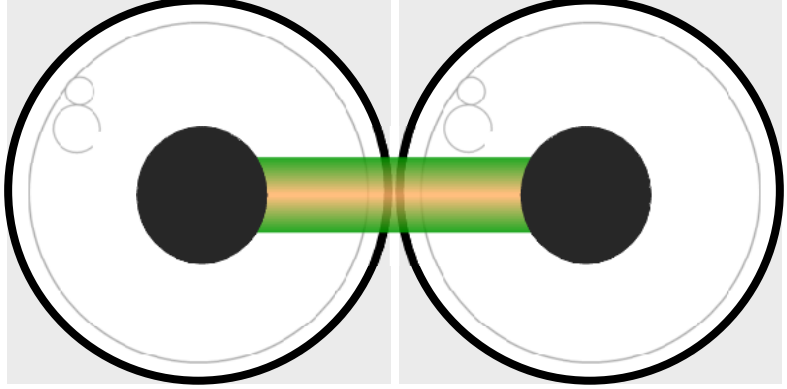
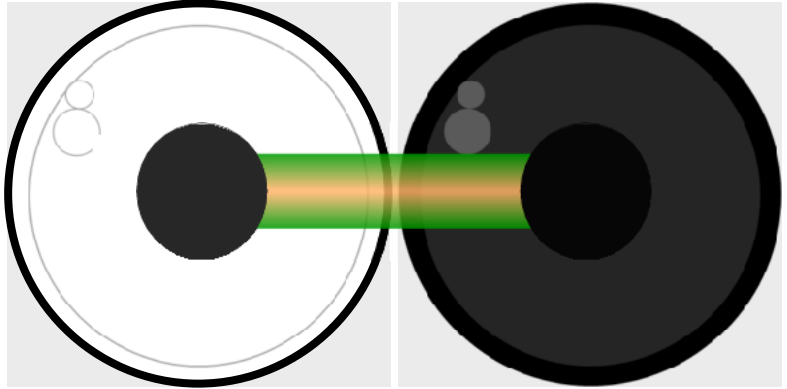
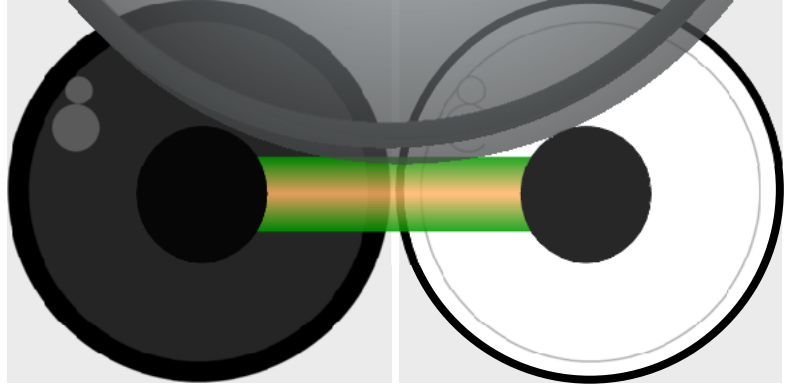
Boris Podolsky

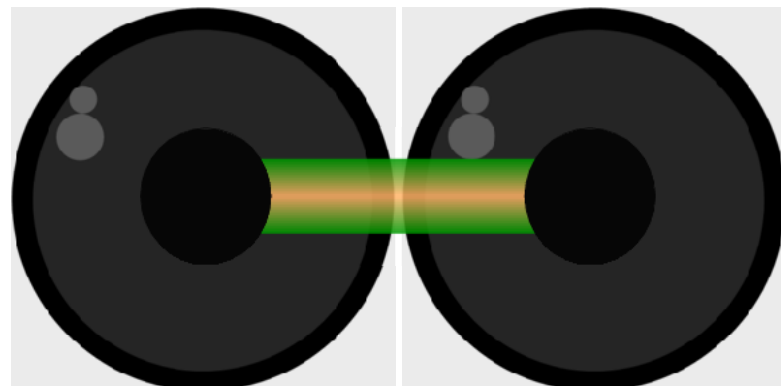
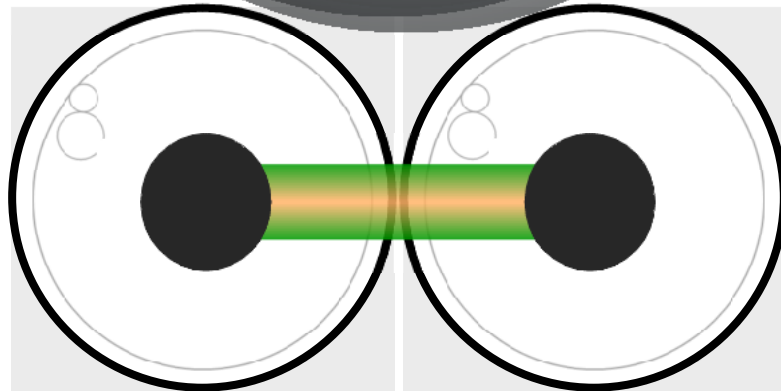
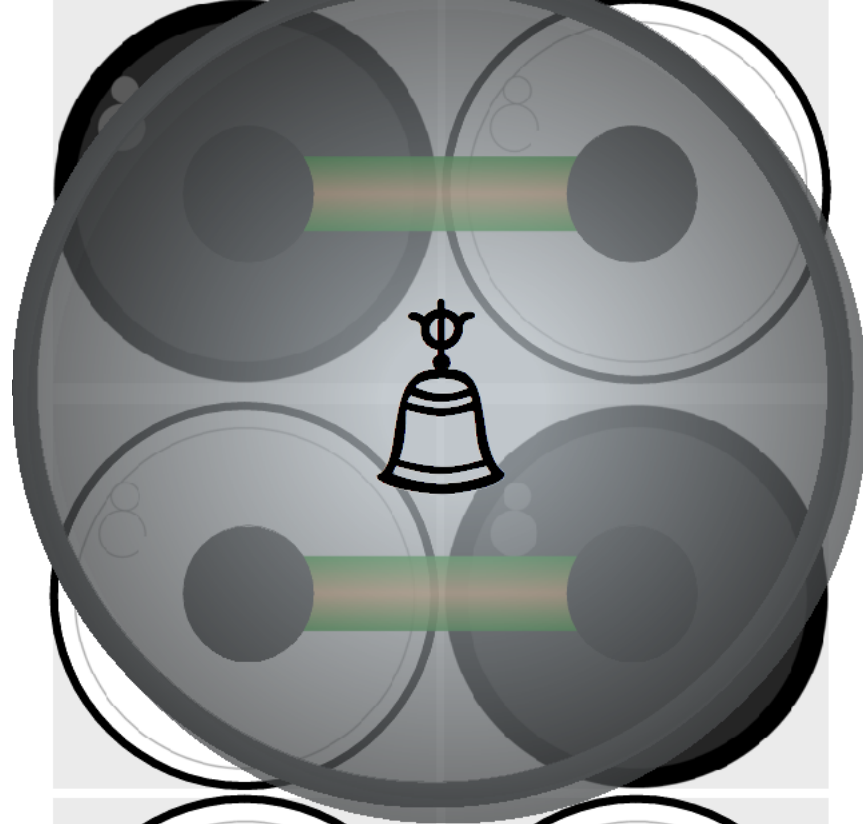


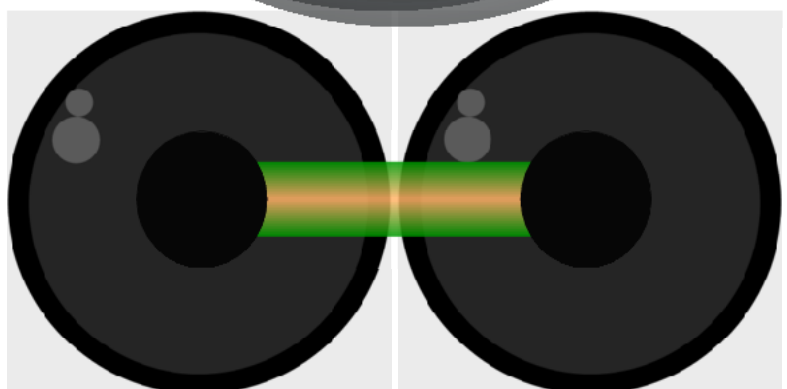
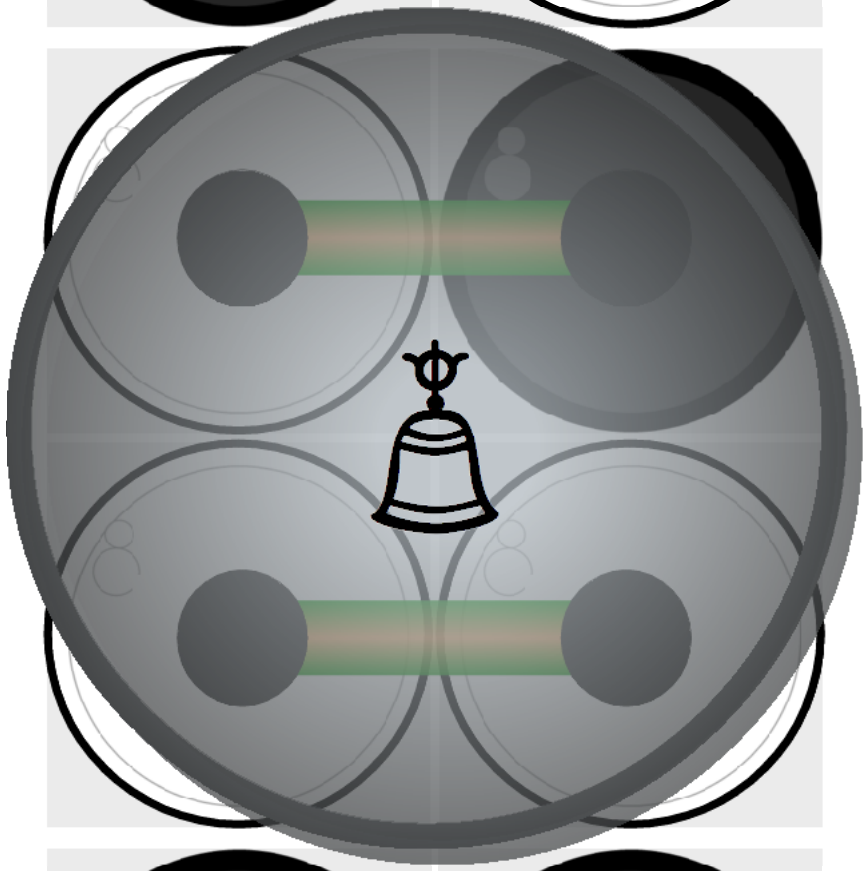
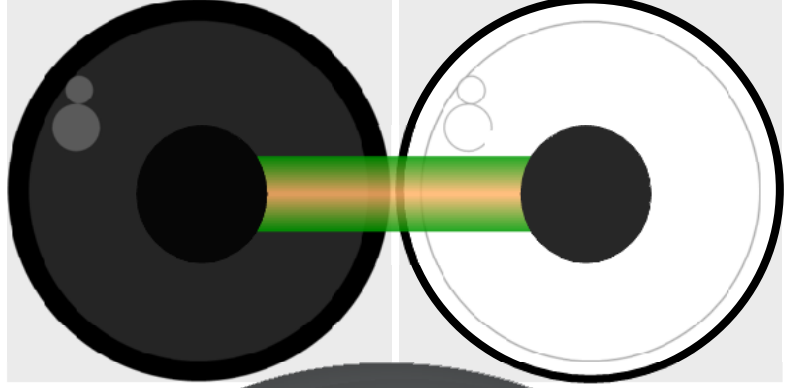


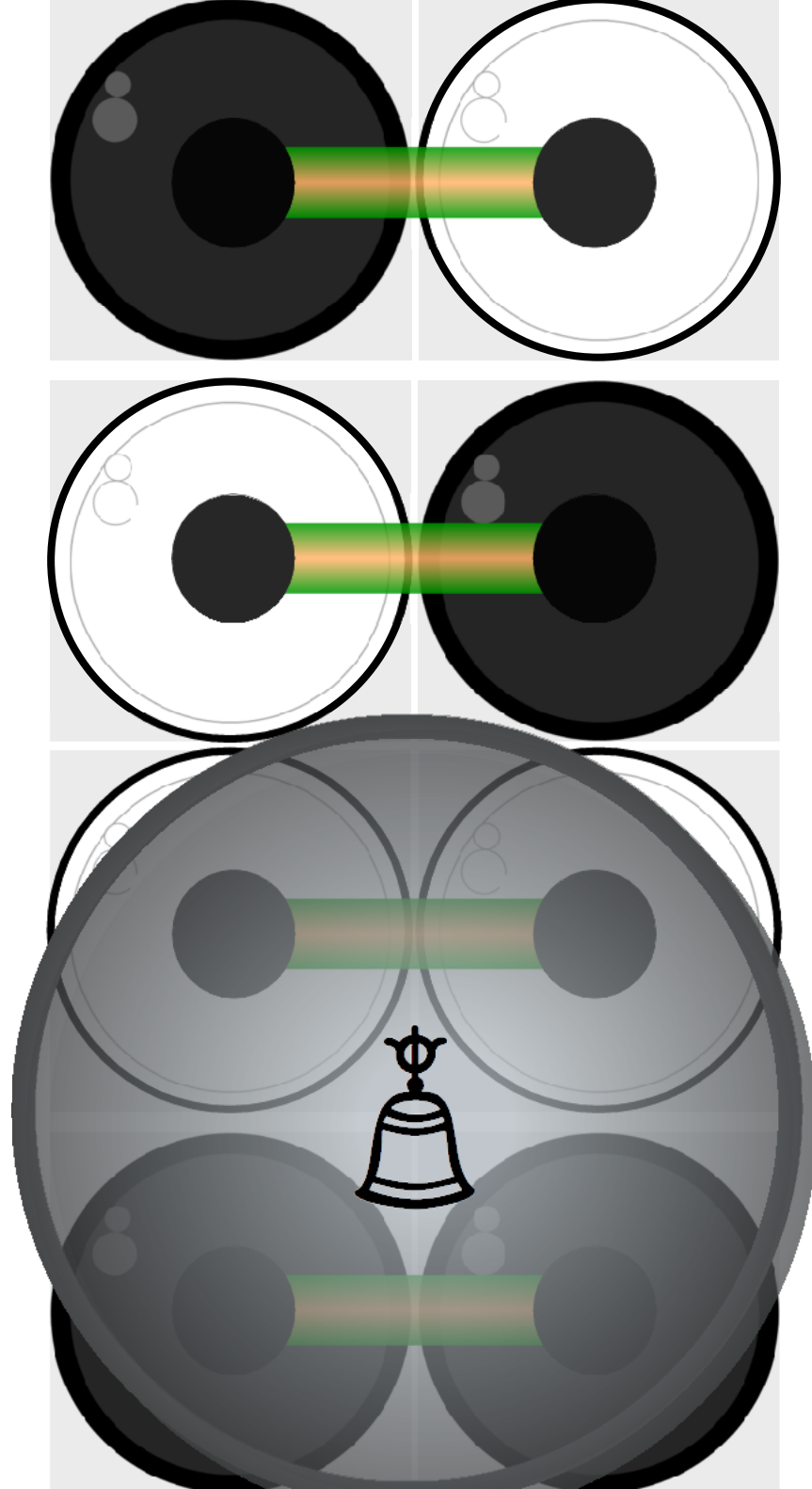
pires de BELL :
généralisation
des paires EPR

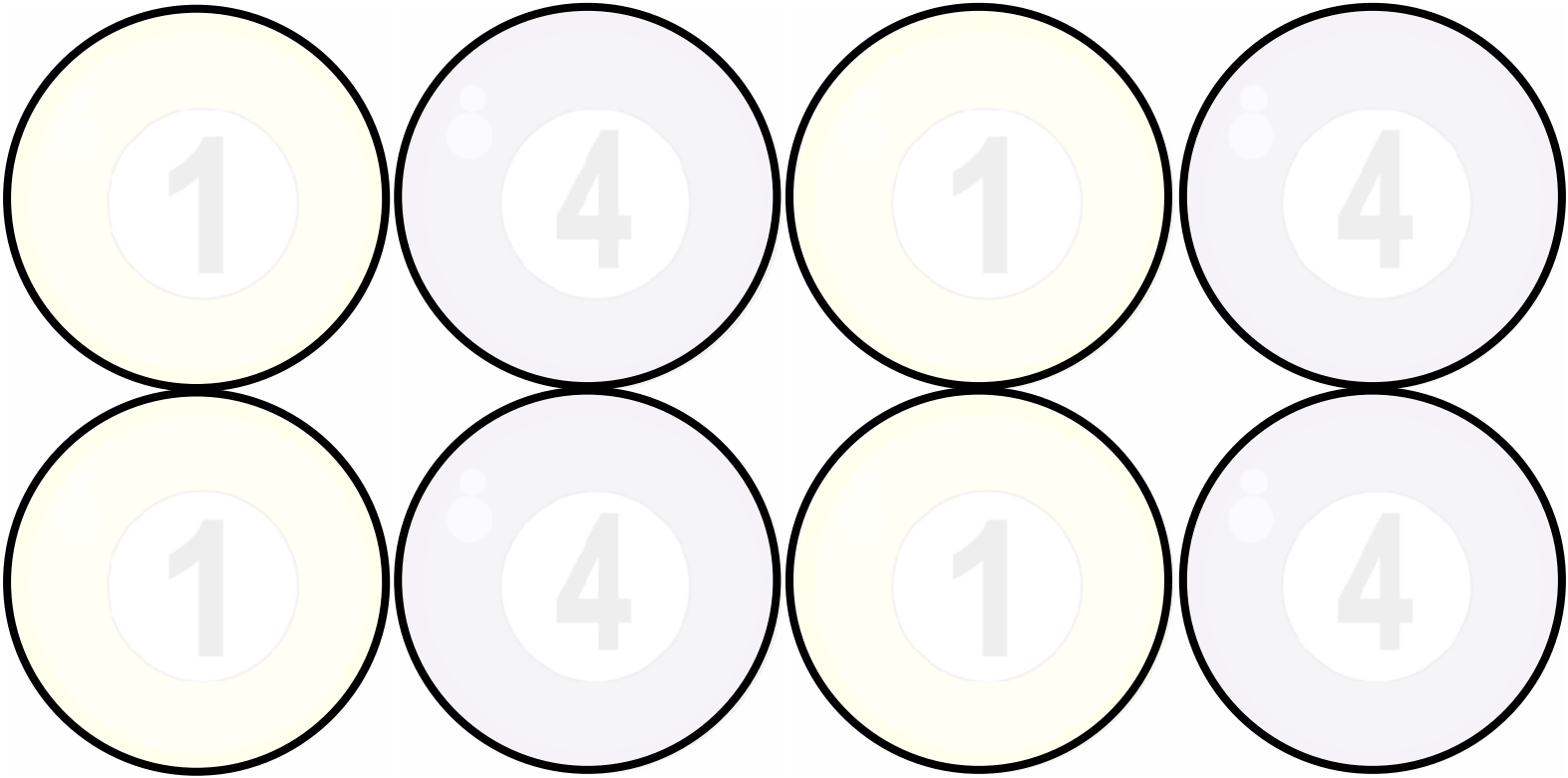


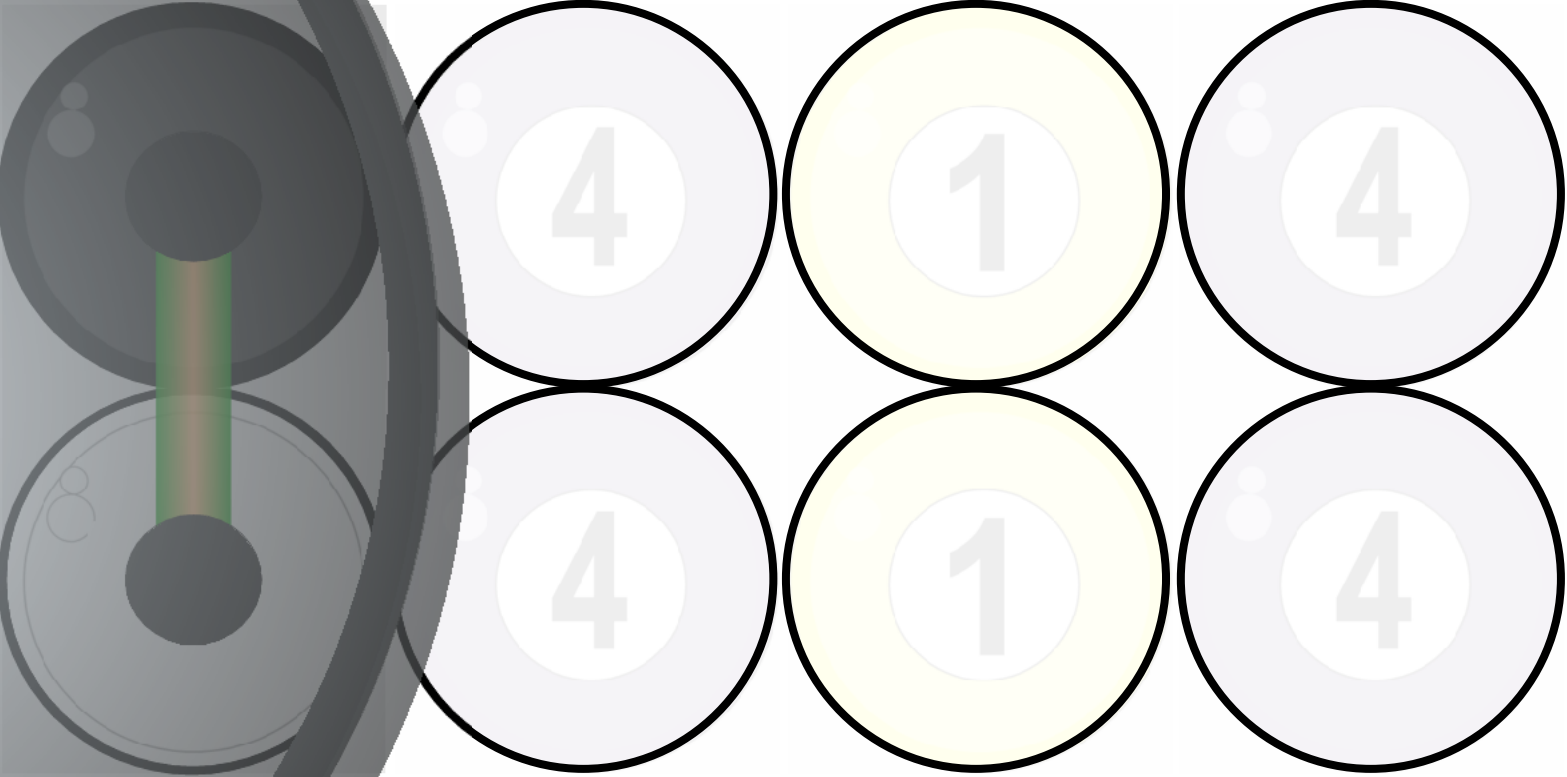
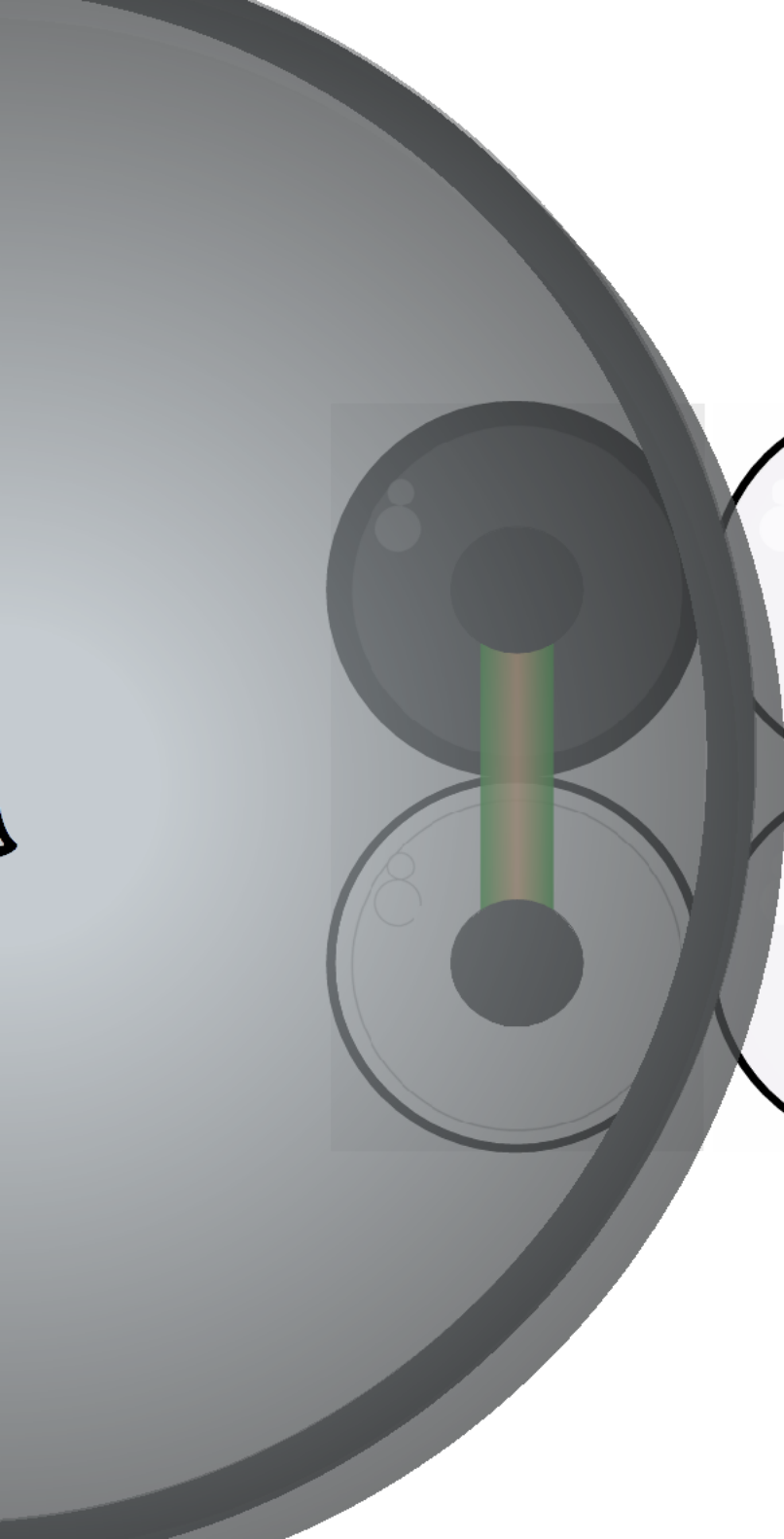


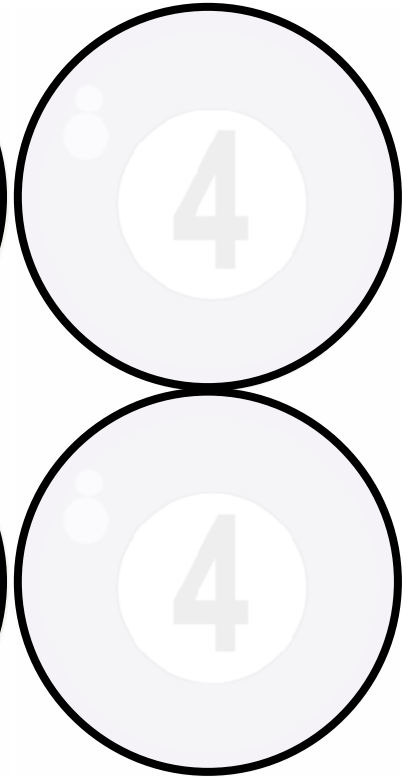
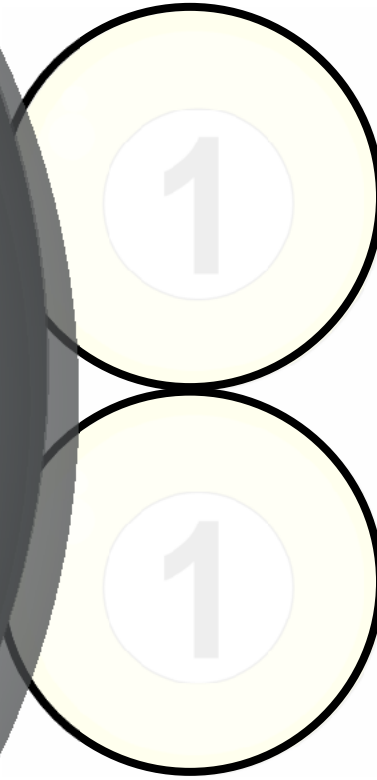
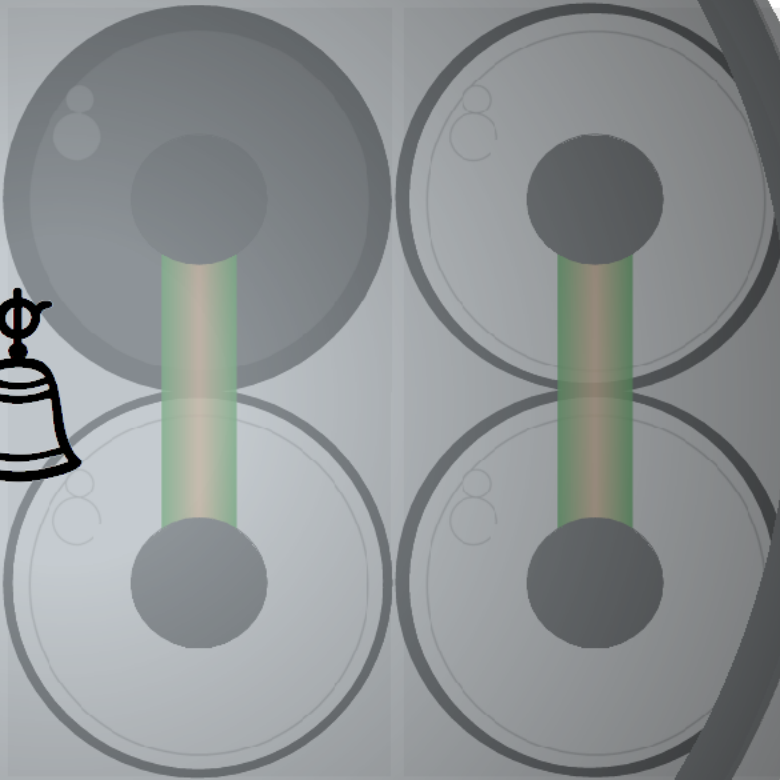


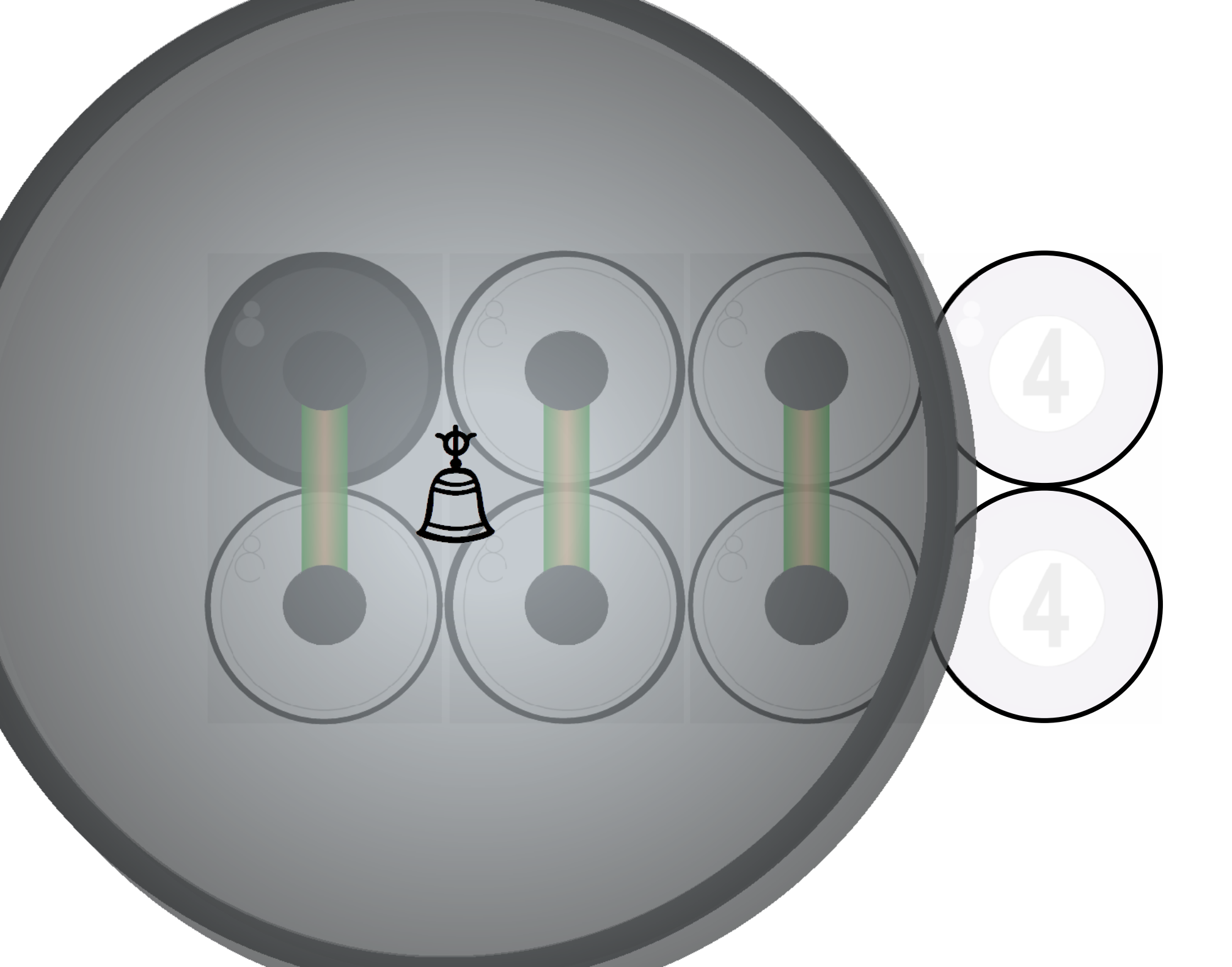


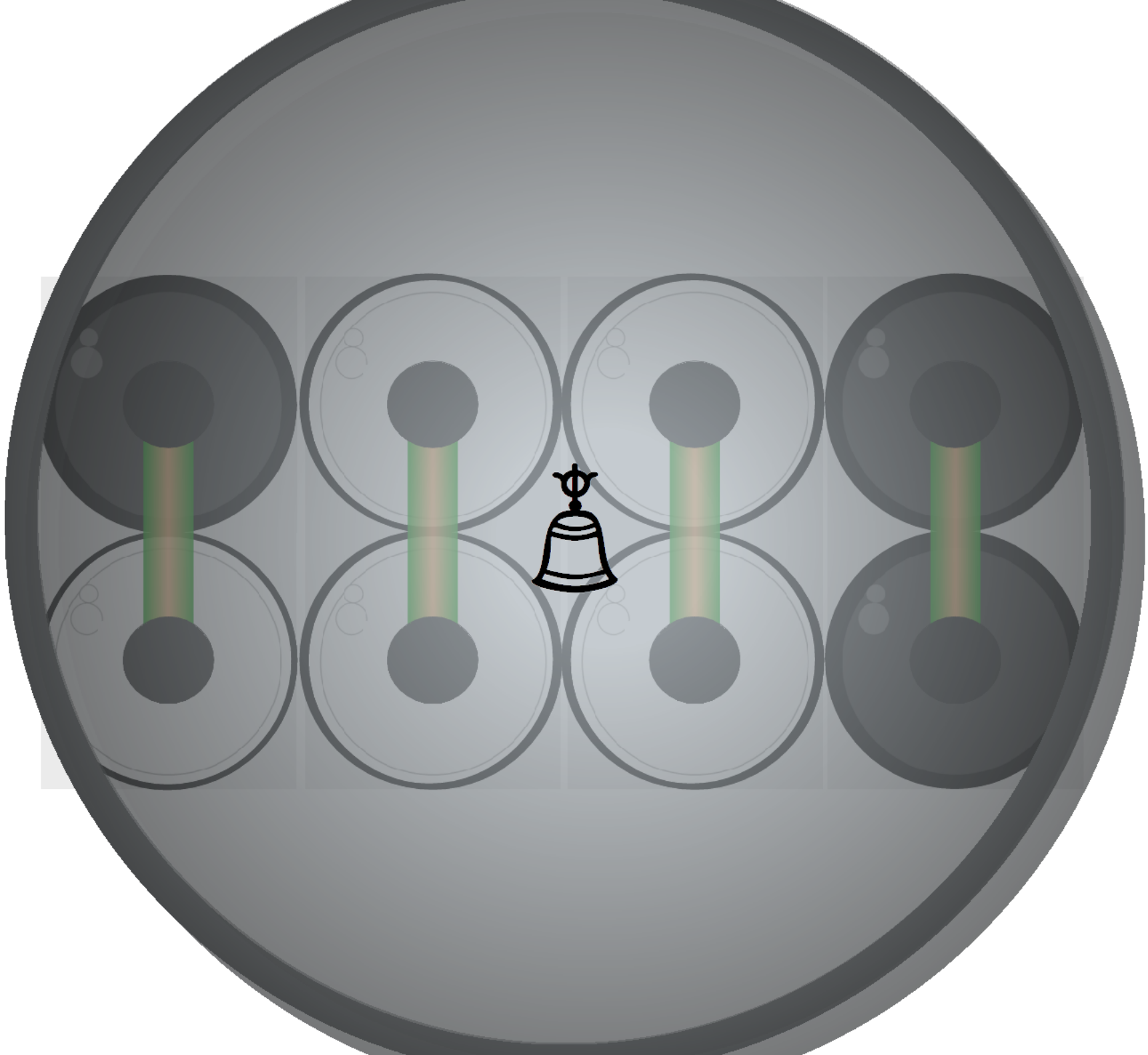








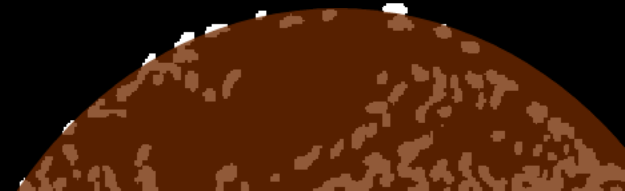
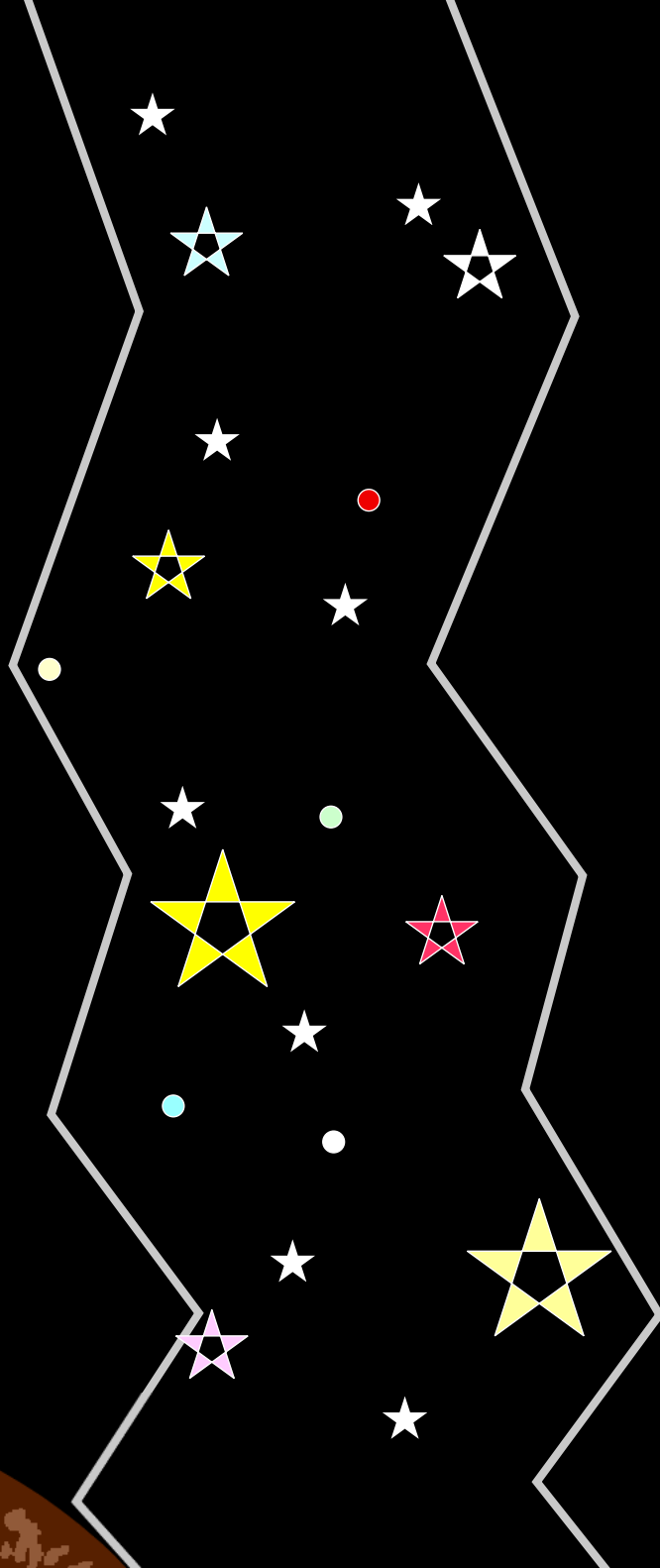


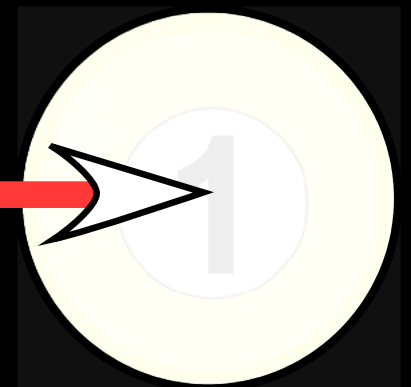
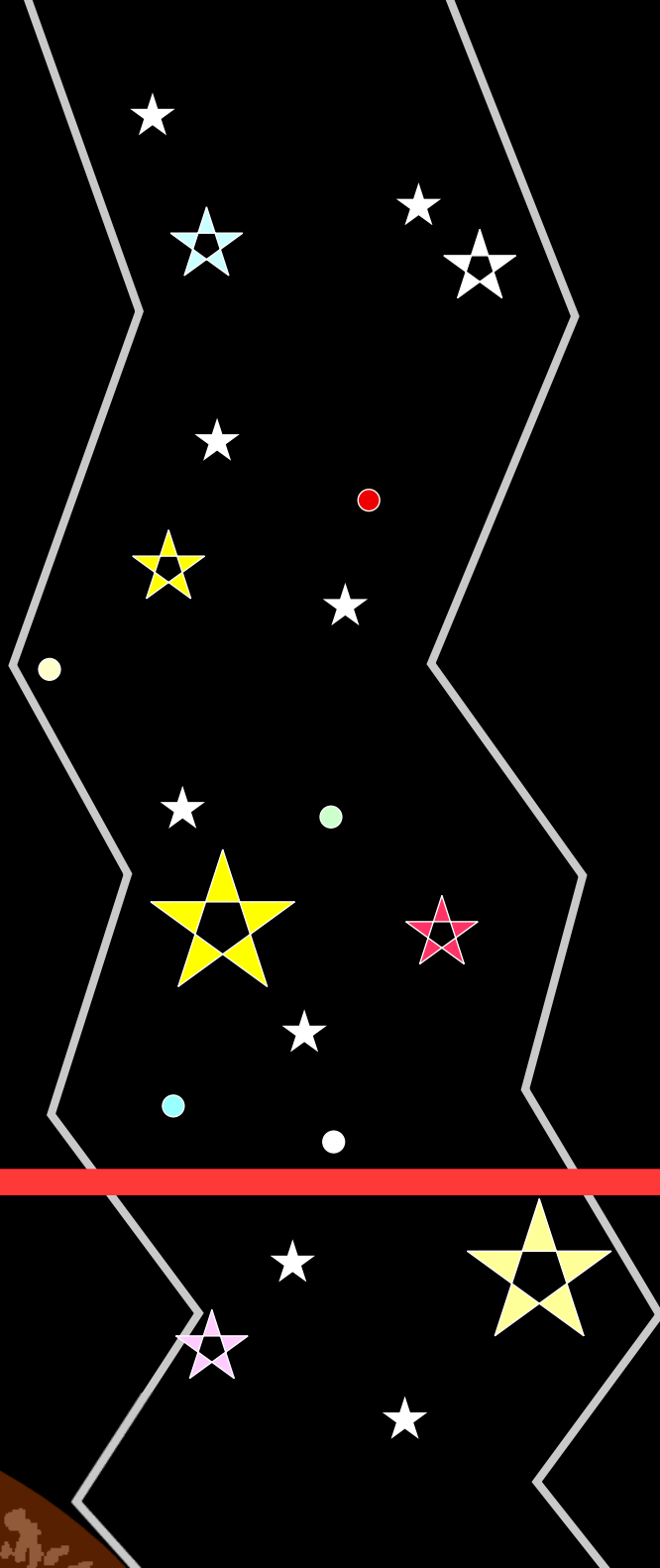


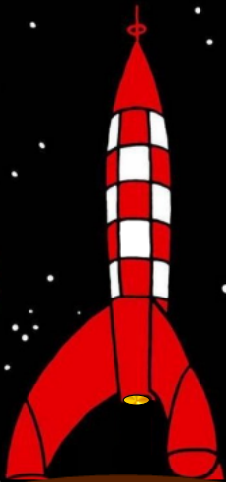
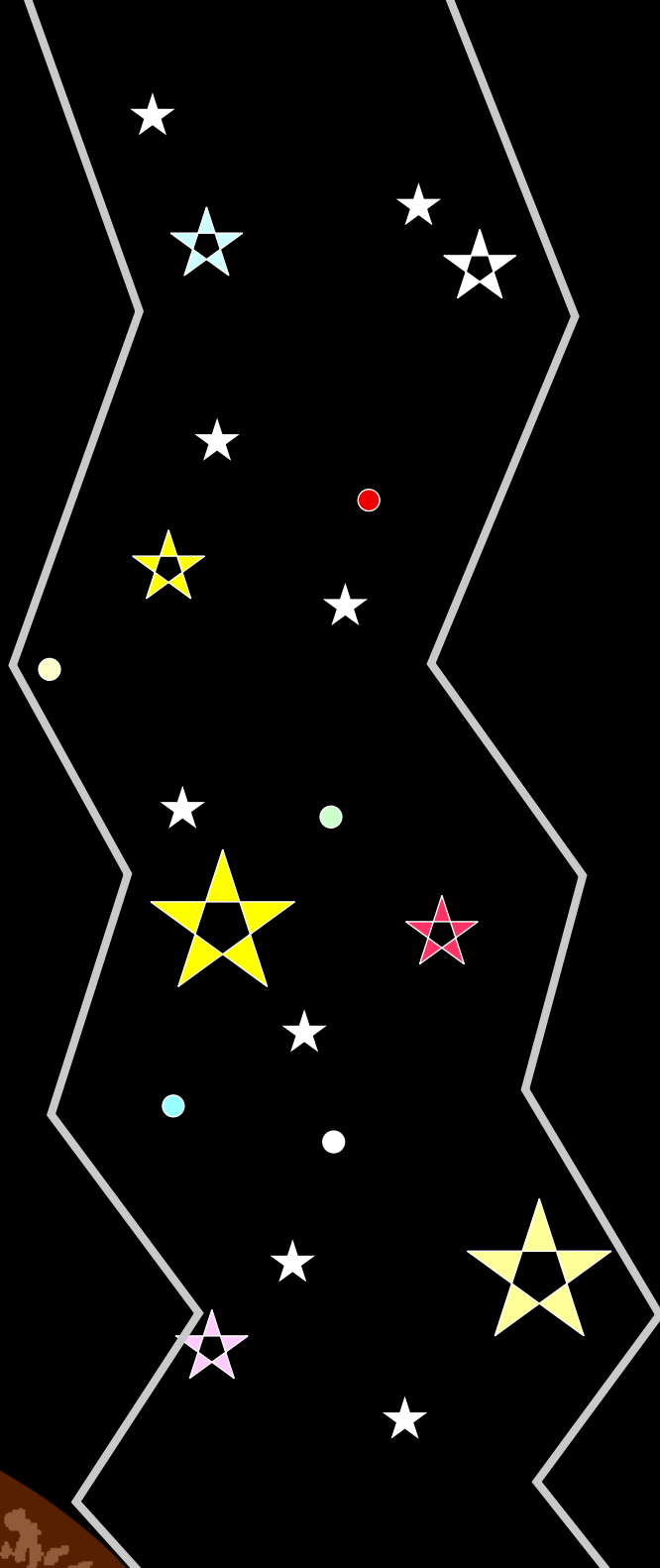
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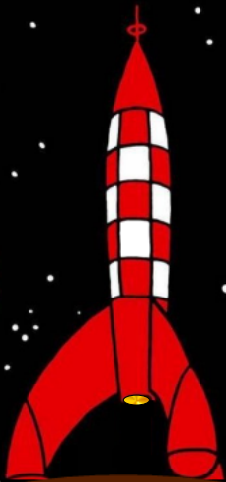
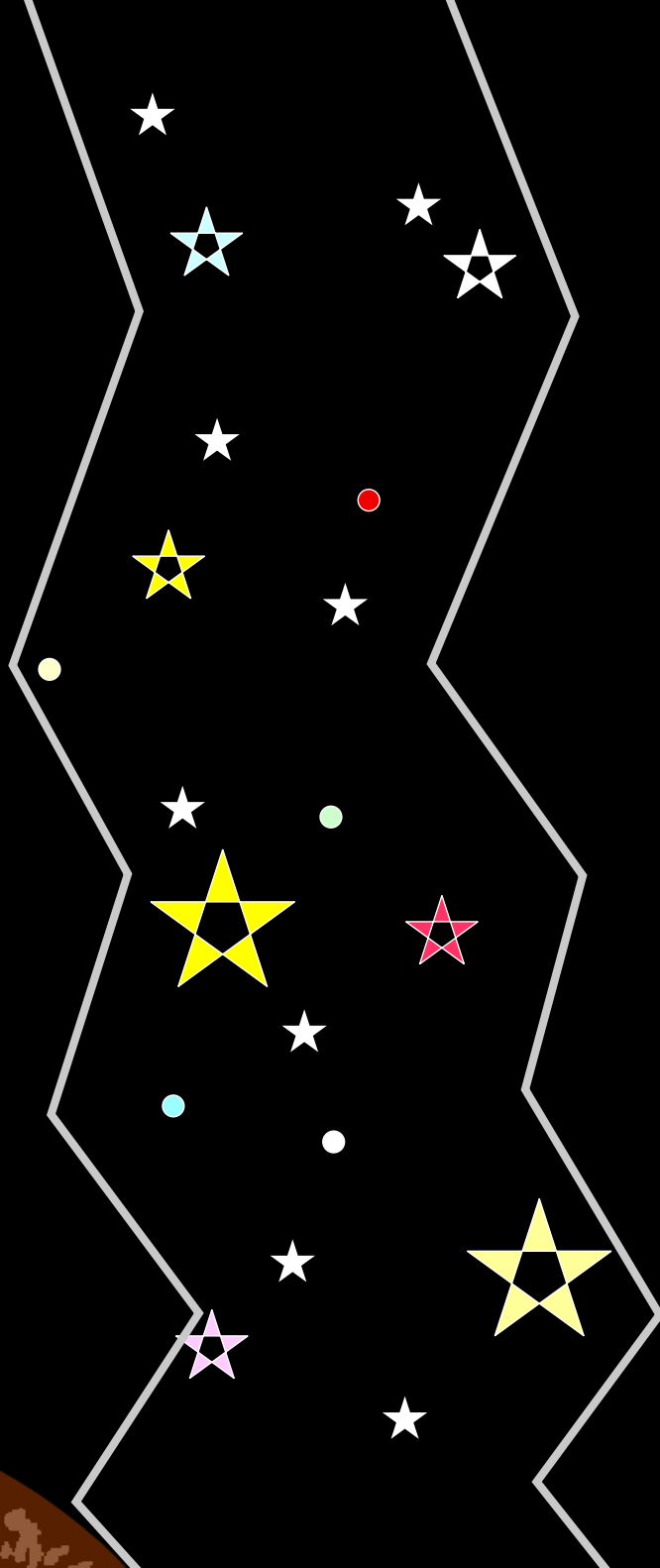
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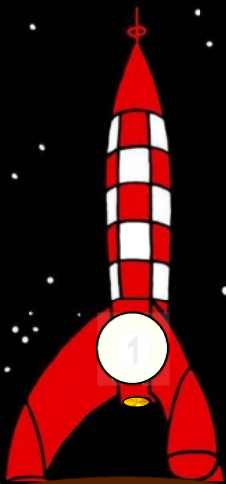
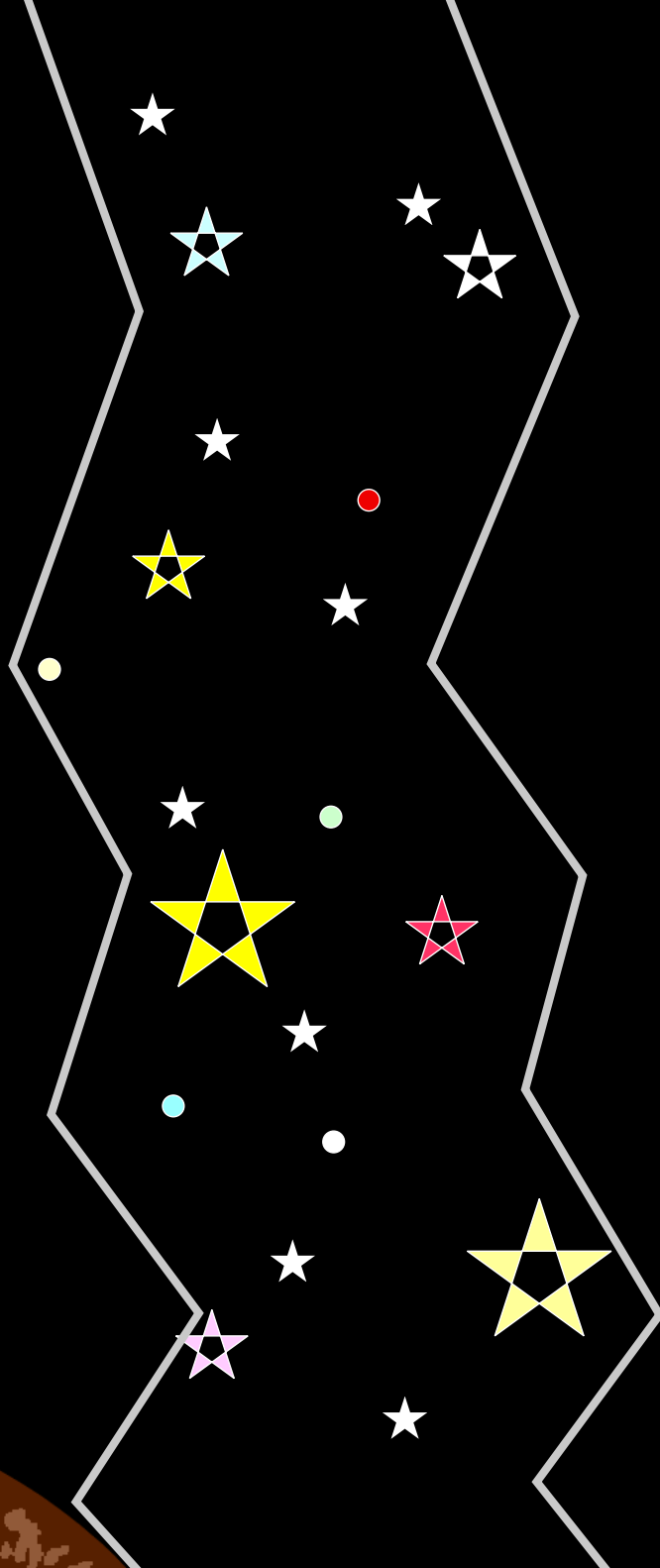
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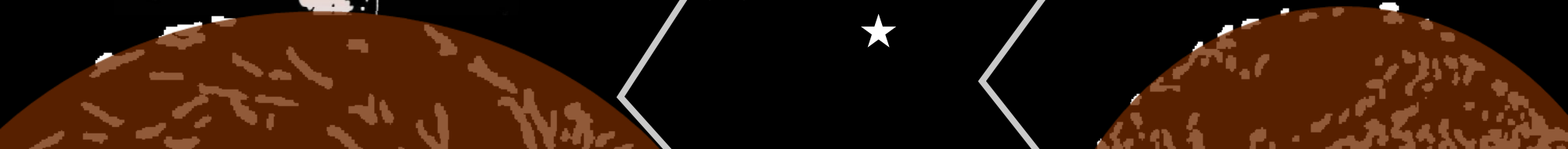
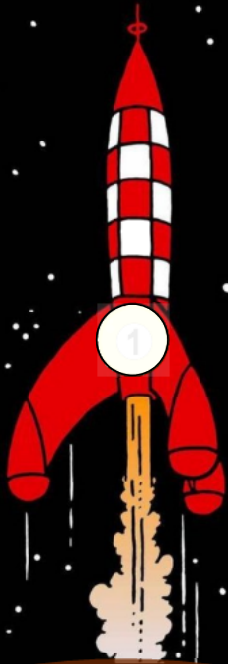
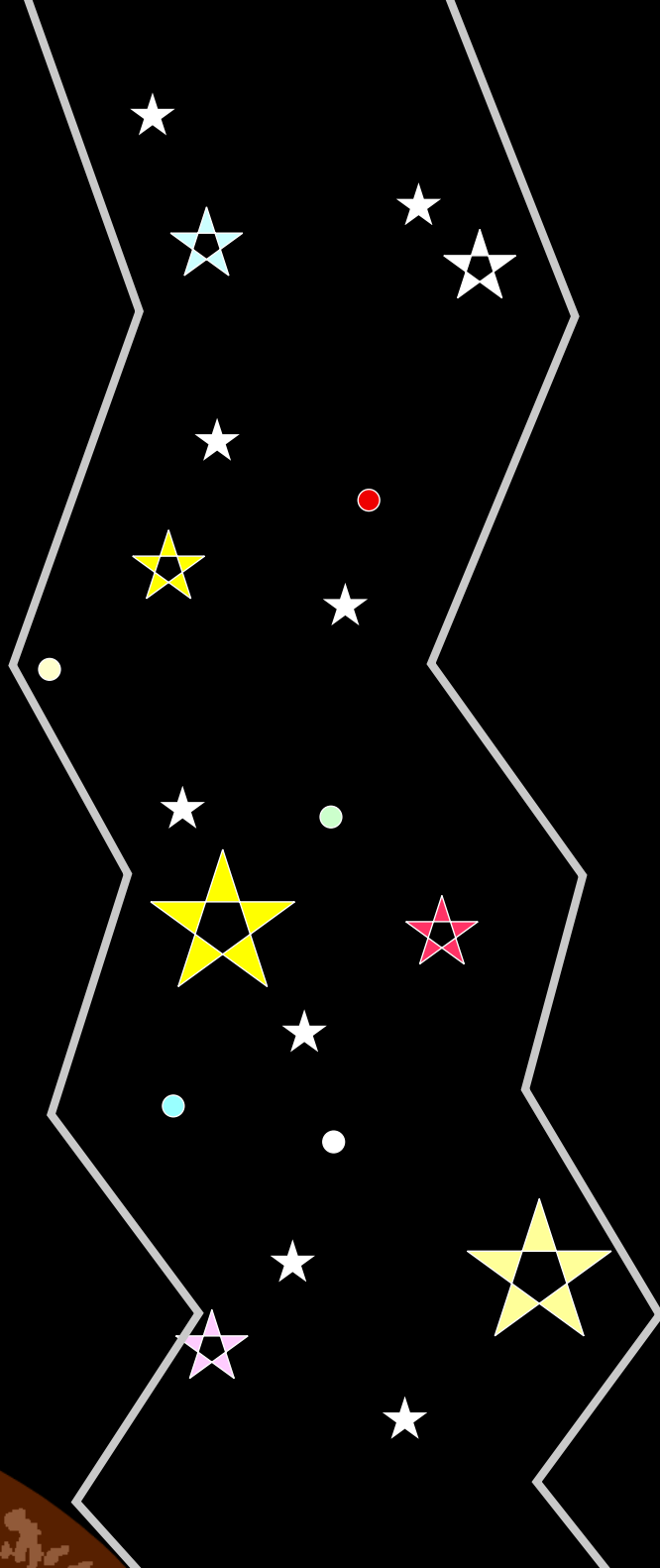


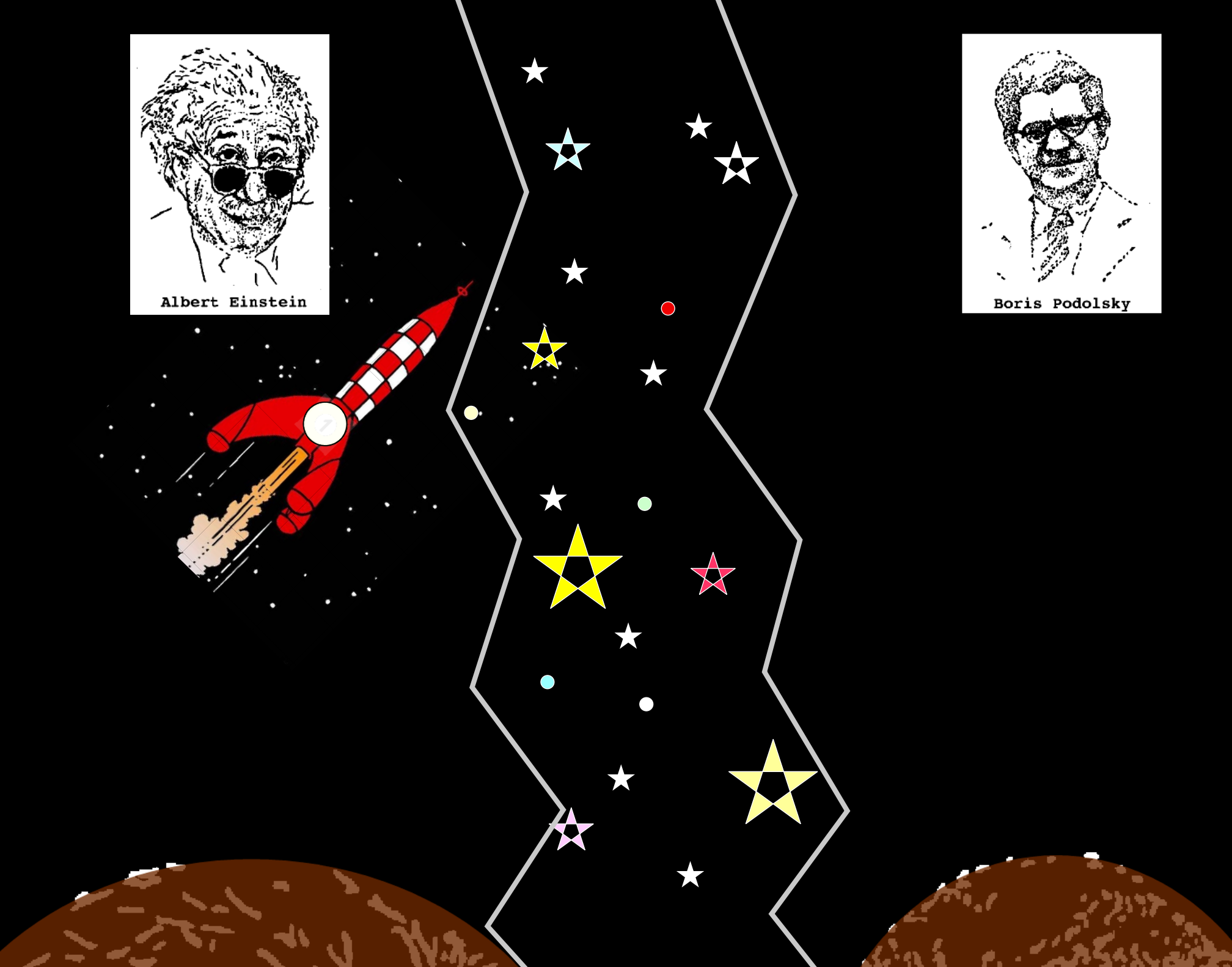


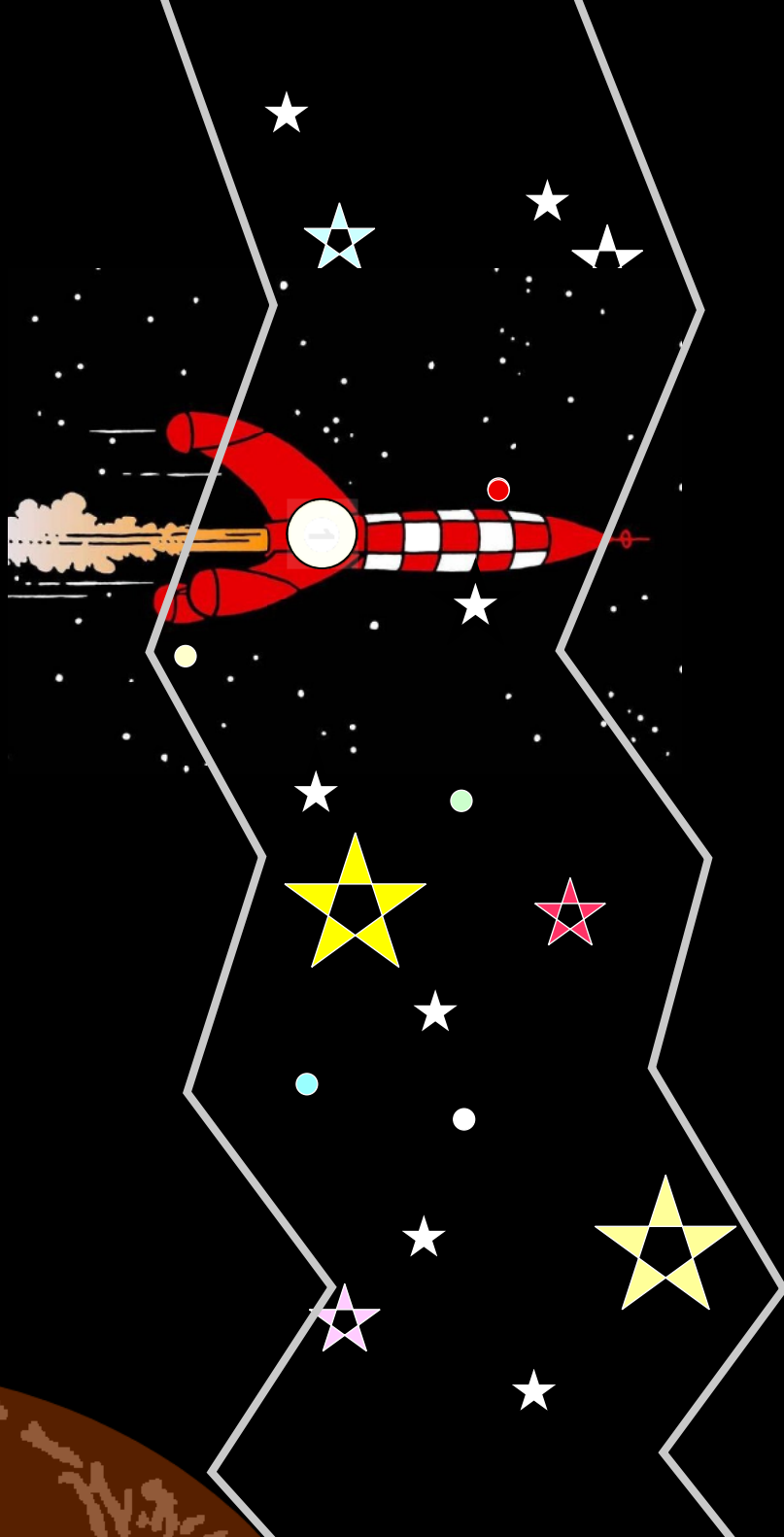










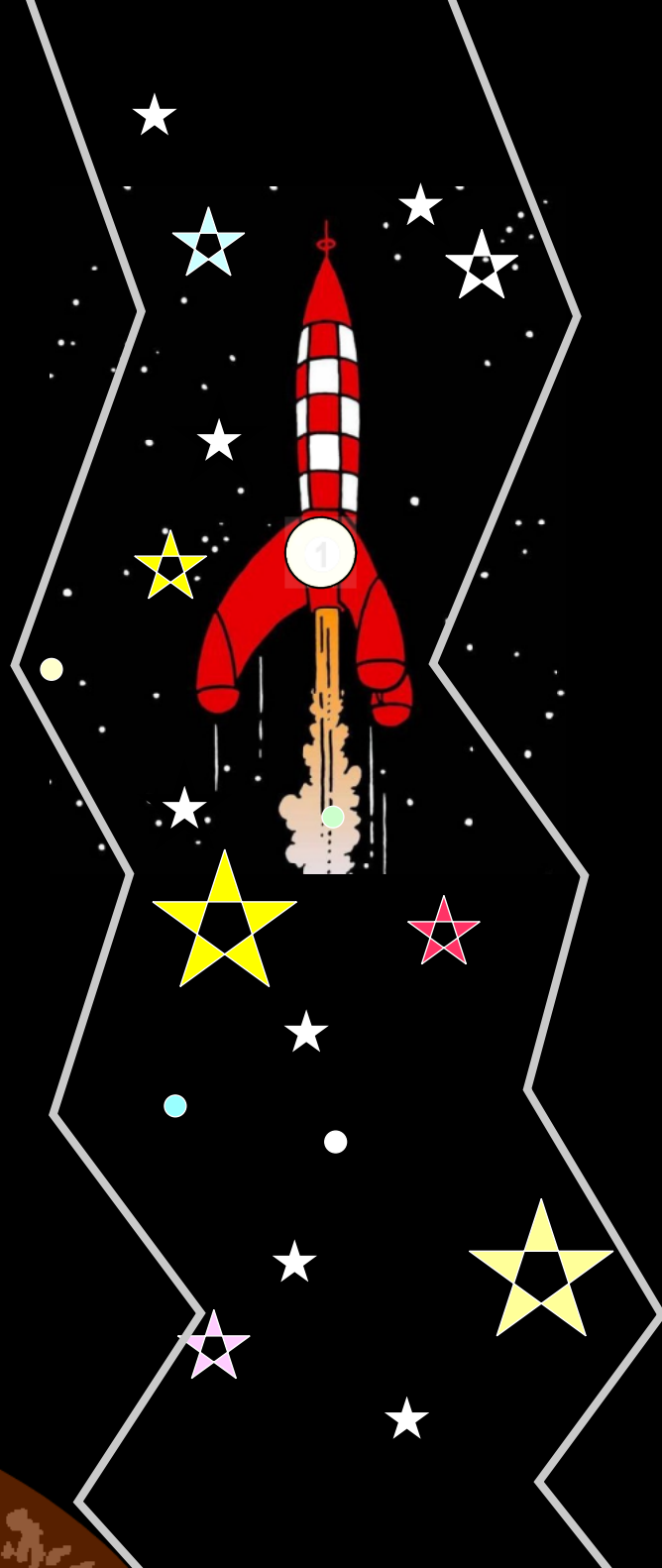




Albert Einstein



Boris Podolsky

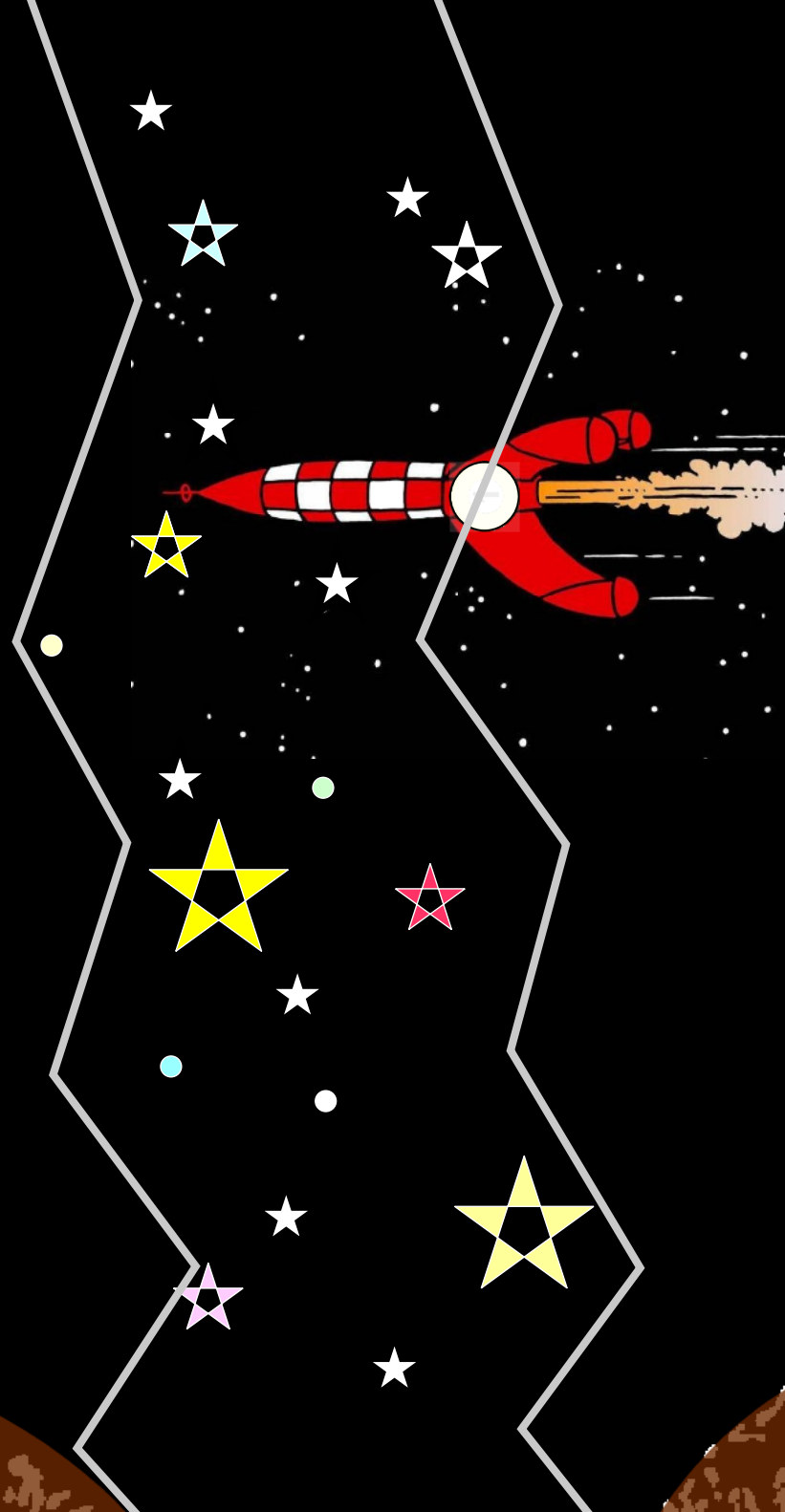




Albert Einstein



Boris Podolsky



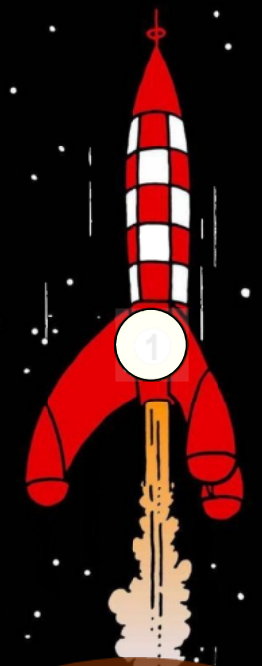
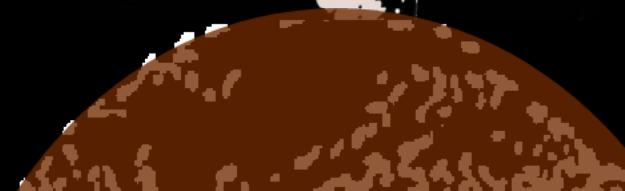
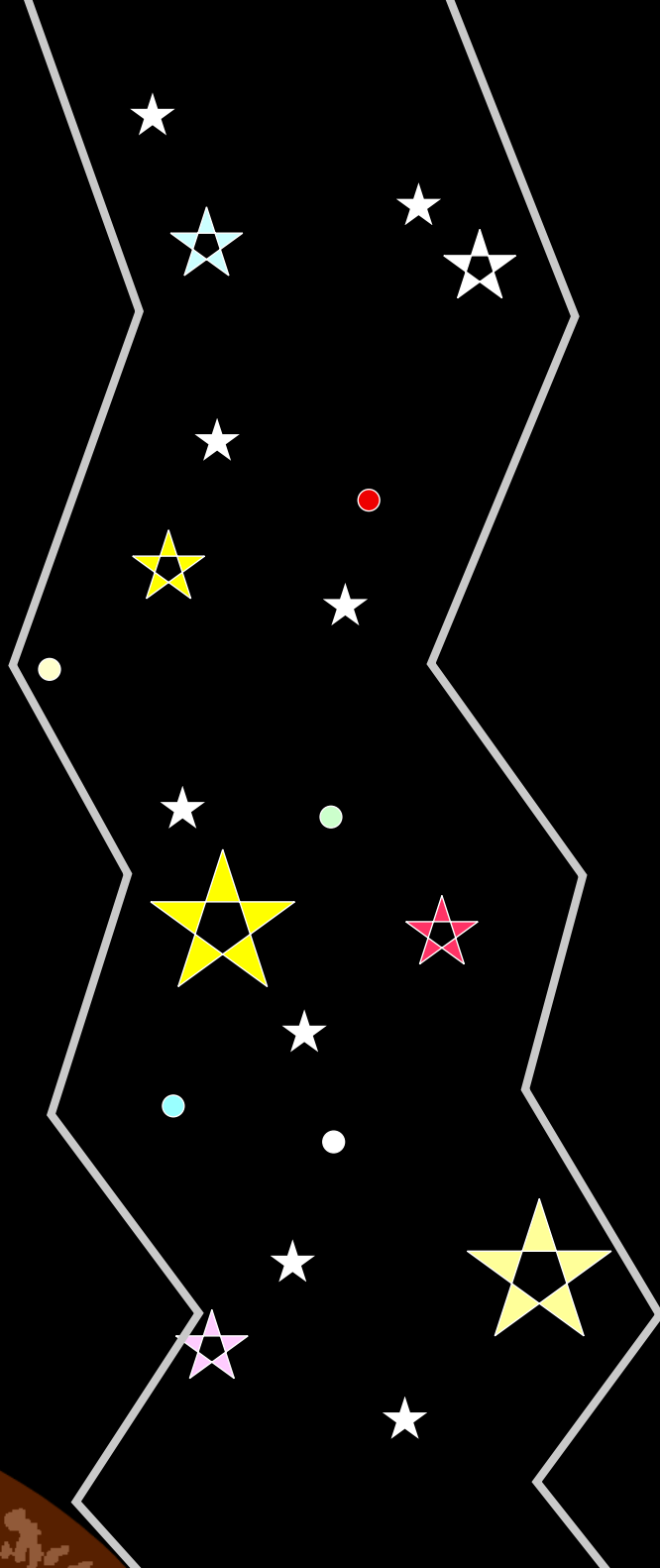




Albert Einstein



Boris Podolsky

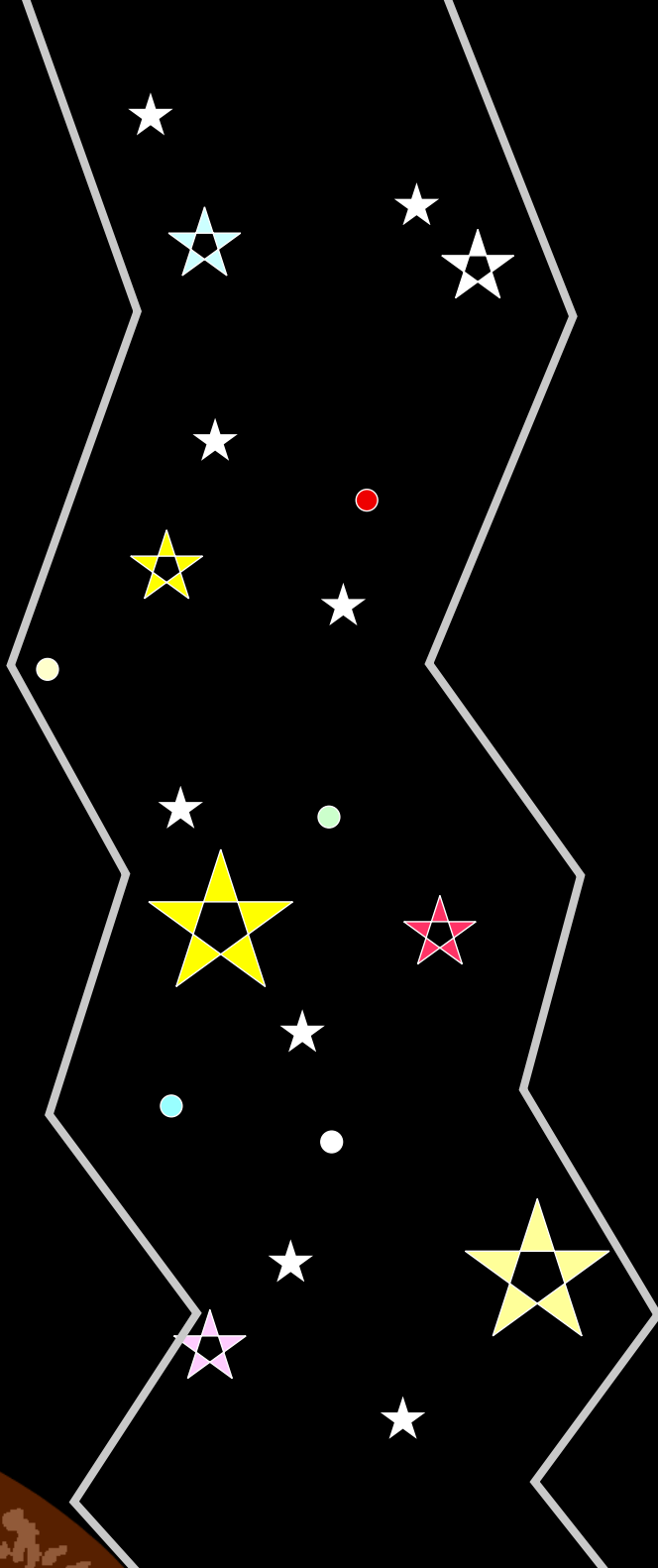




Albert Einstein



Boris Podolsky

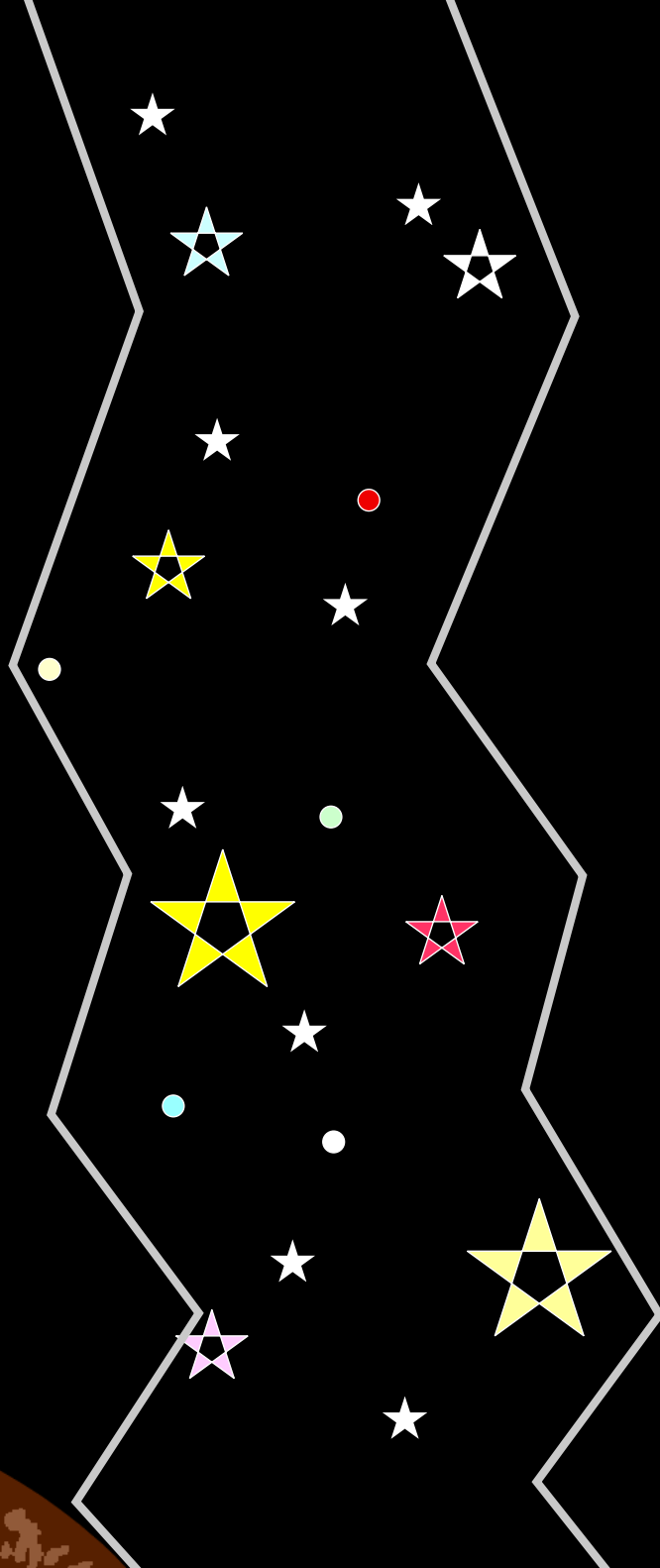




Albert Einstein



Boris Podolsky

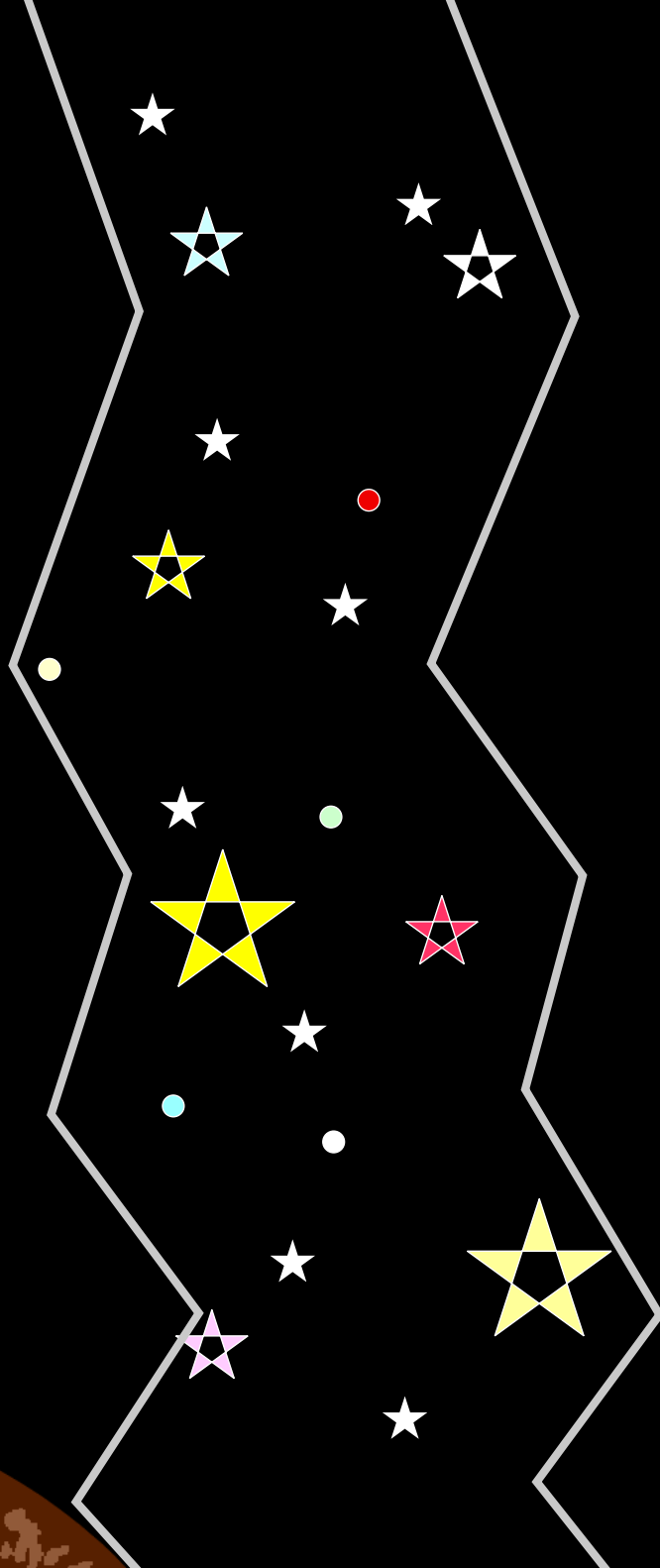


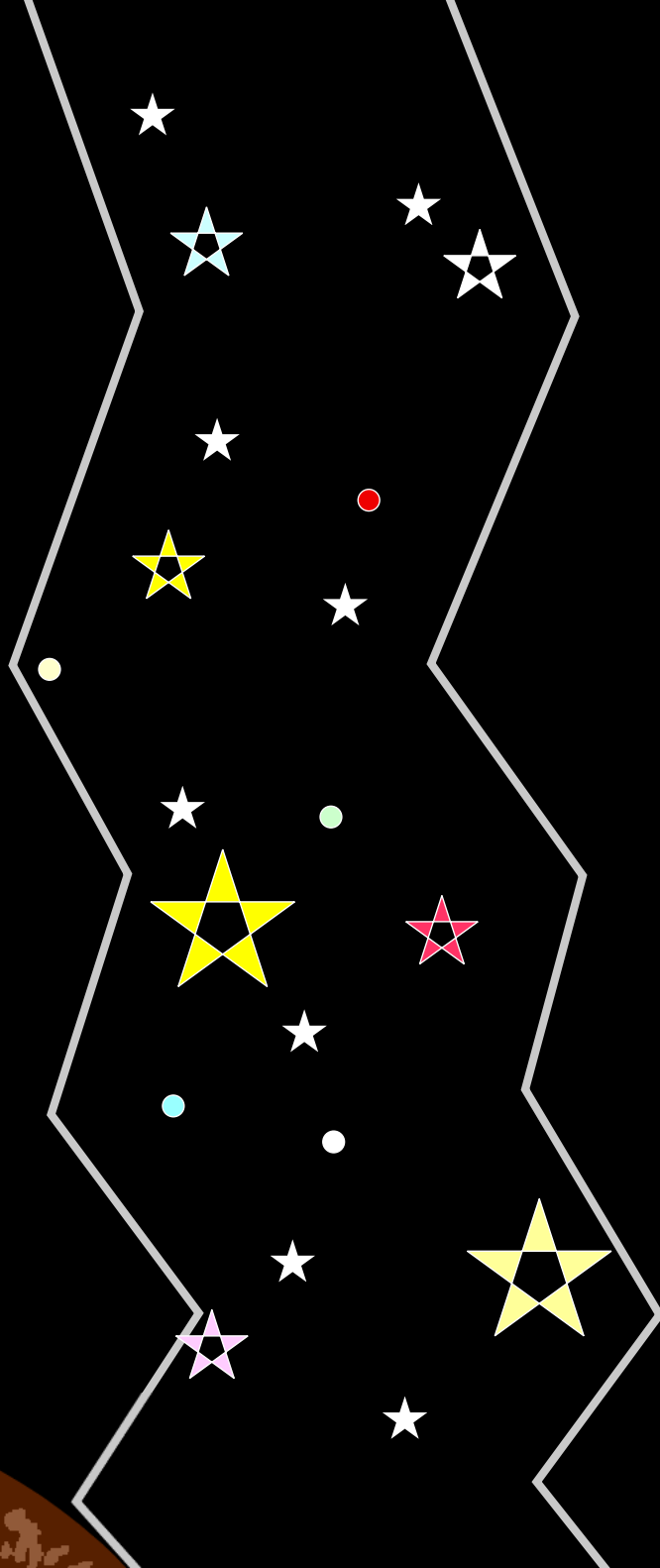


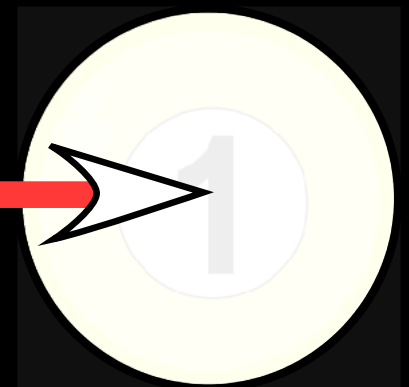
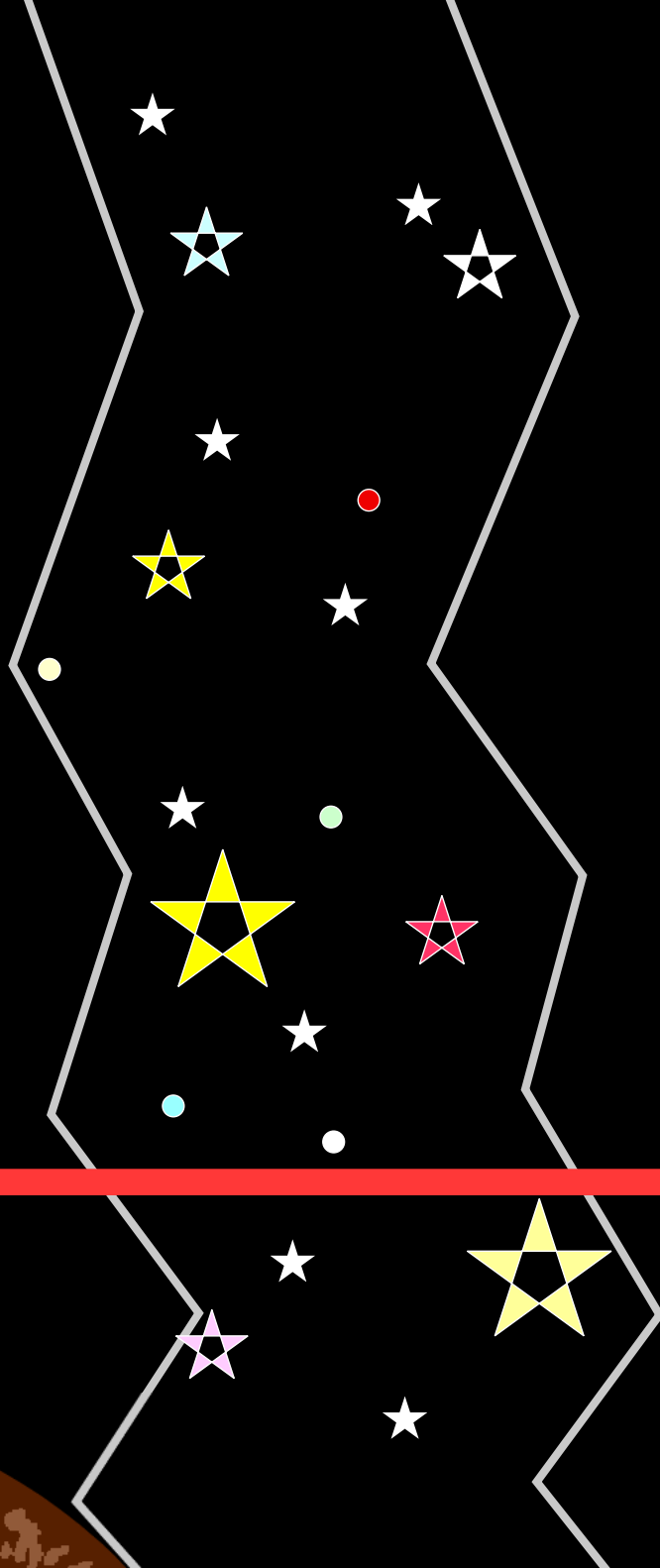
Albert Einstein



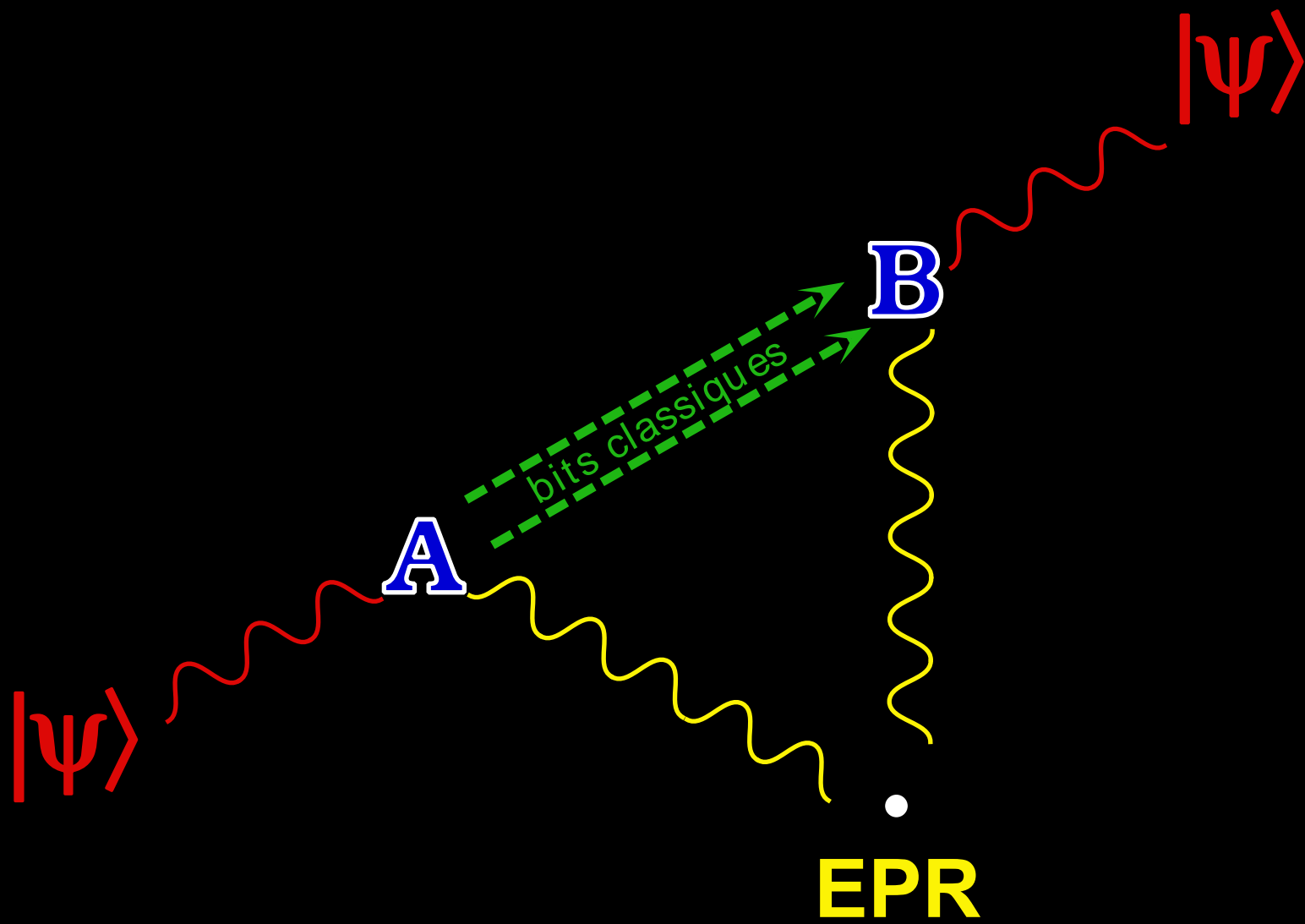
Boris Podolsky

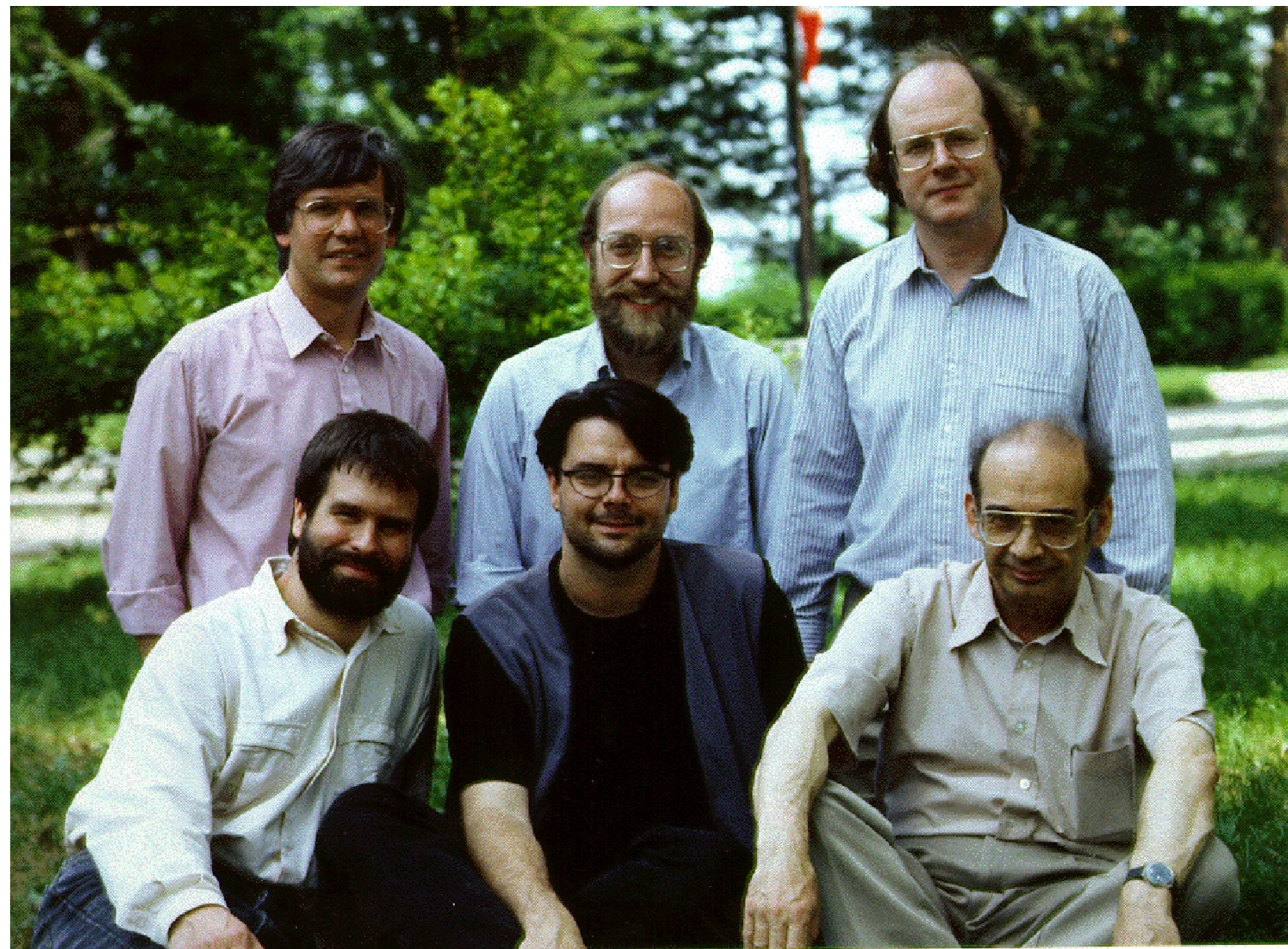






Téléportation



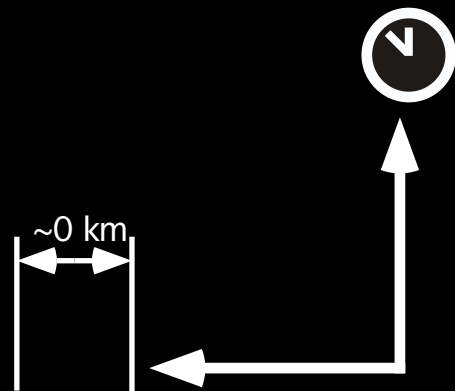


$|\psi\rangle$

A

B

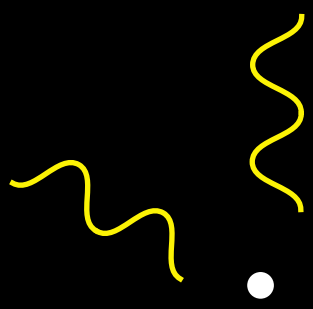
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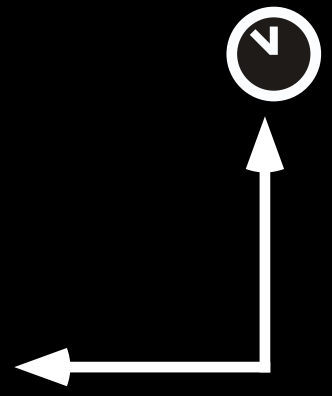
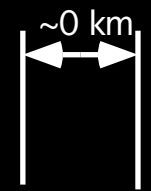
$|\psi\rangle$

A

B

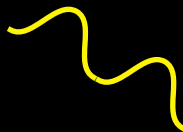


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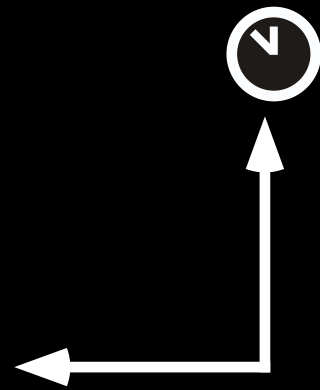
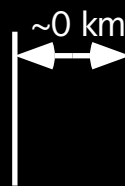


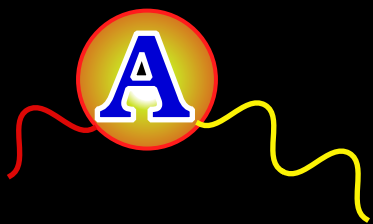


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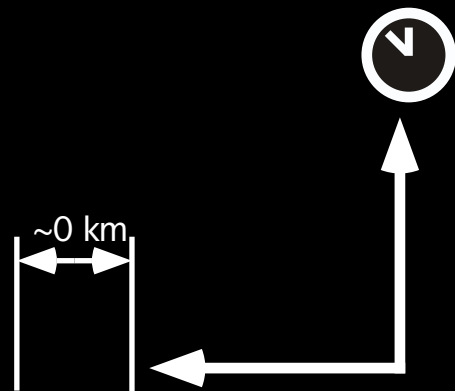


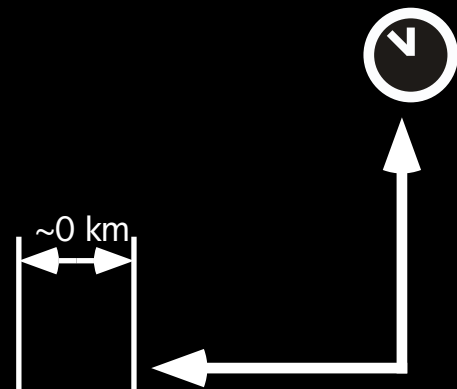
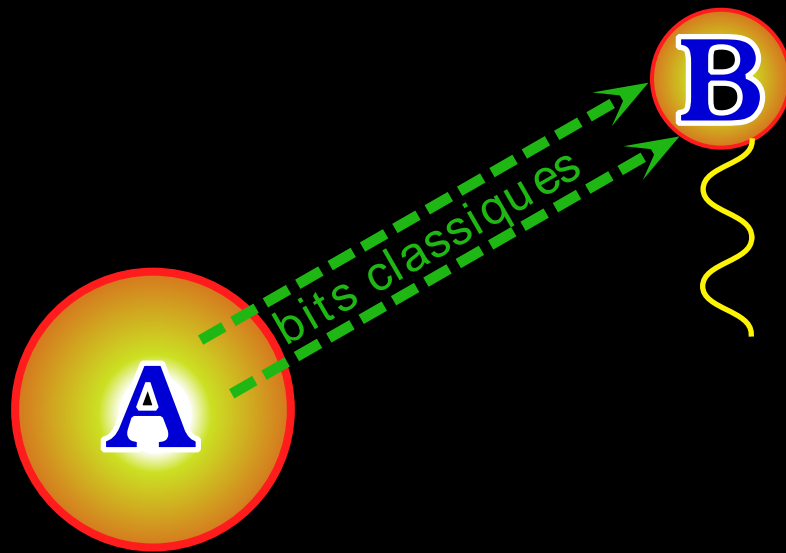
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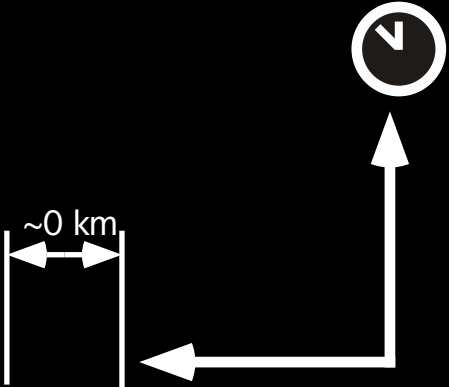
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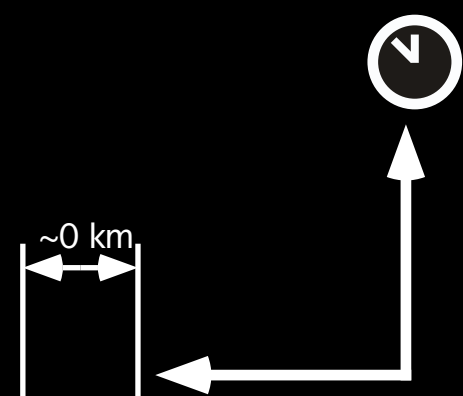


A



A

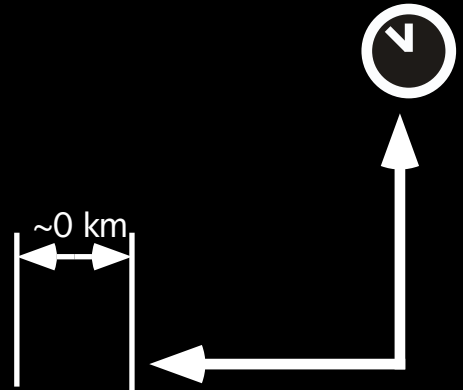
B



A

B

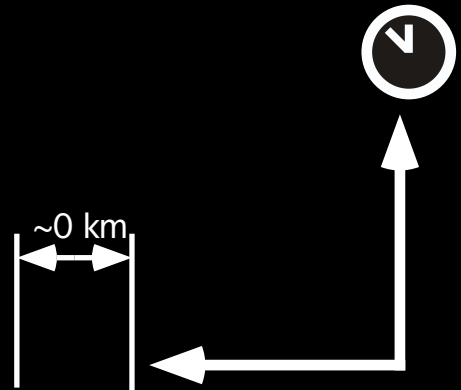
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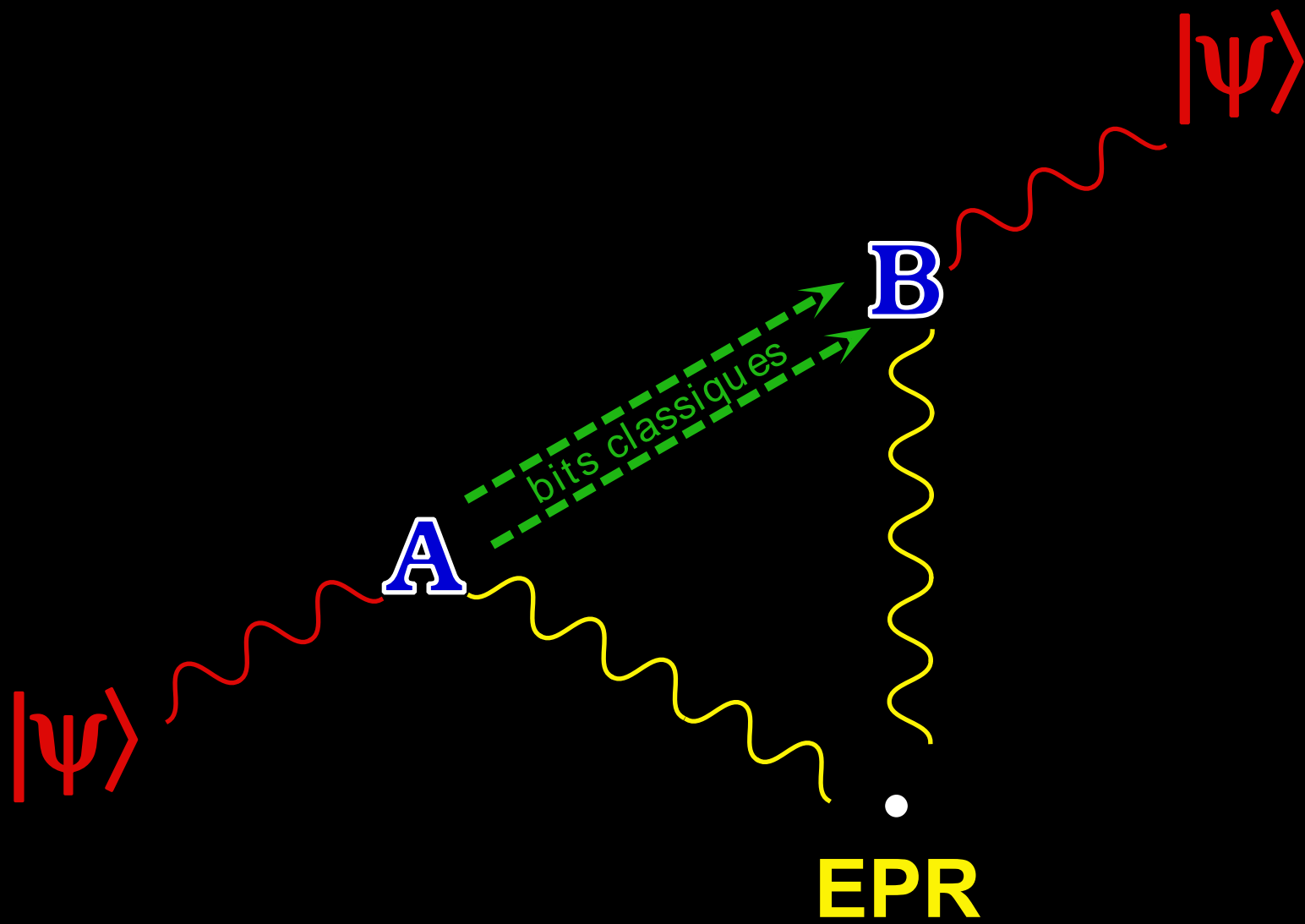


A

B

$|\psi\rangle$



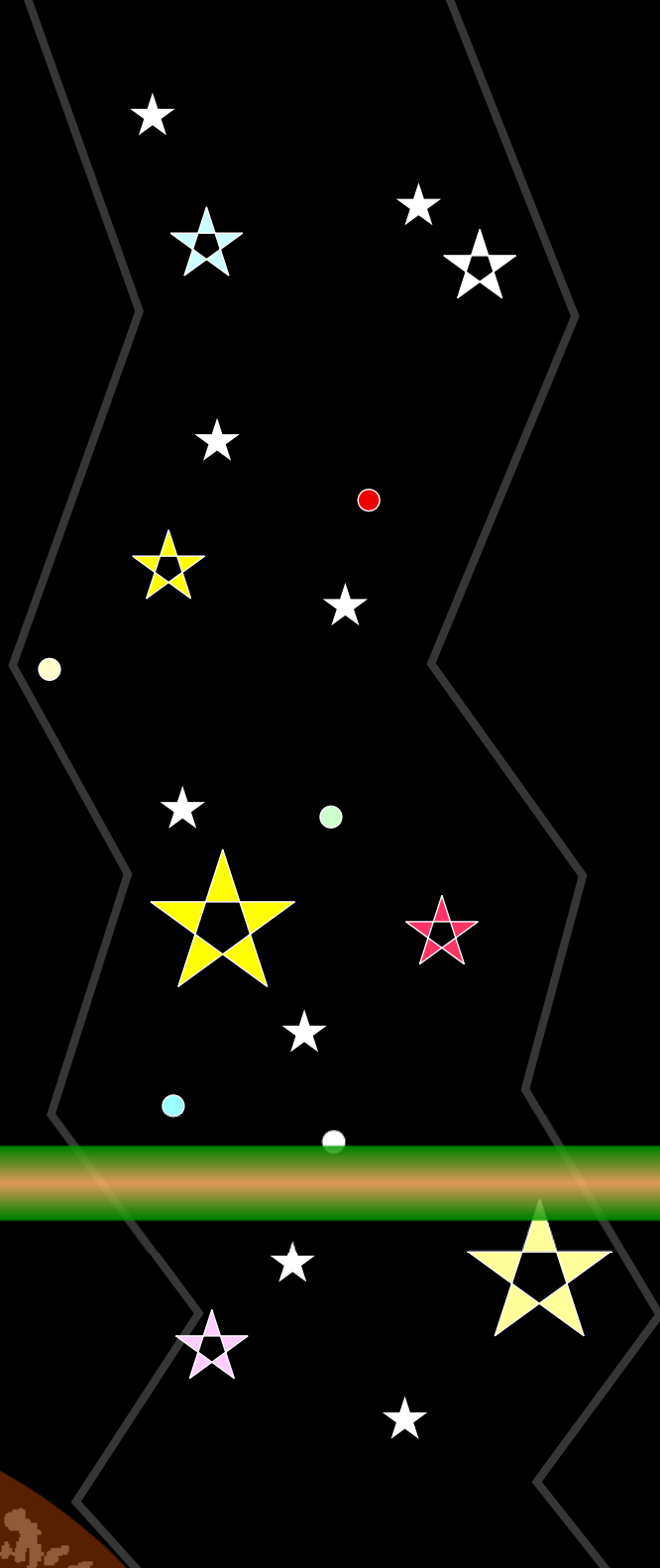
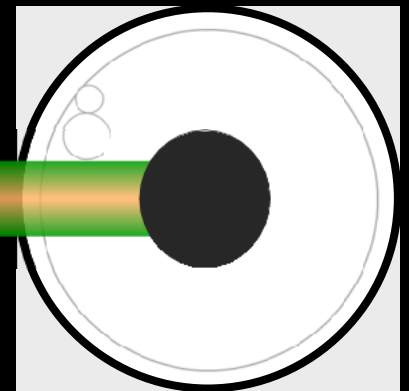
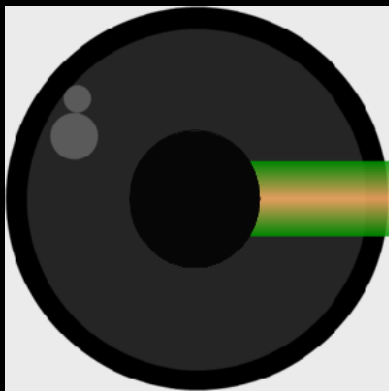


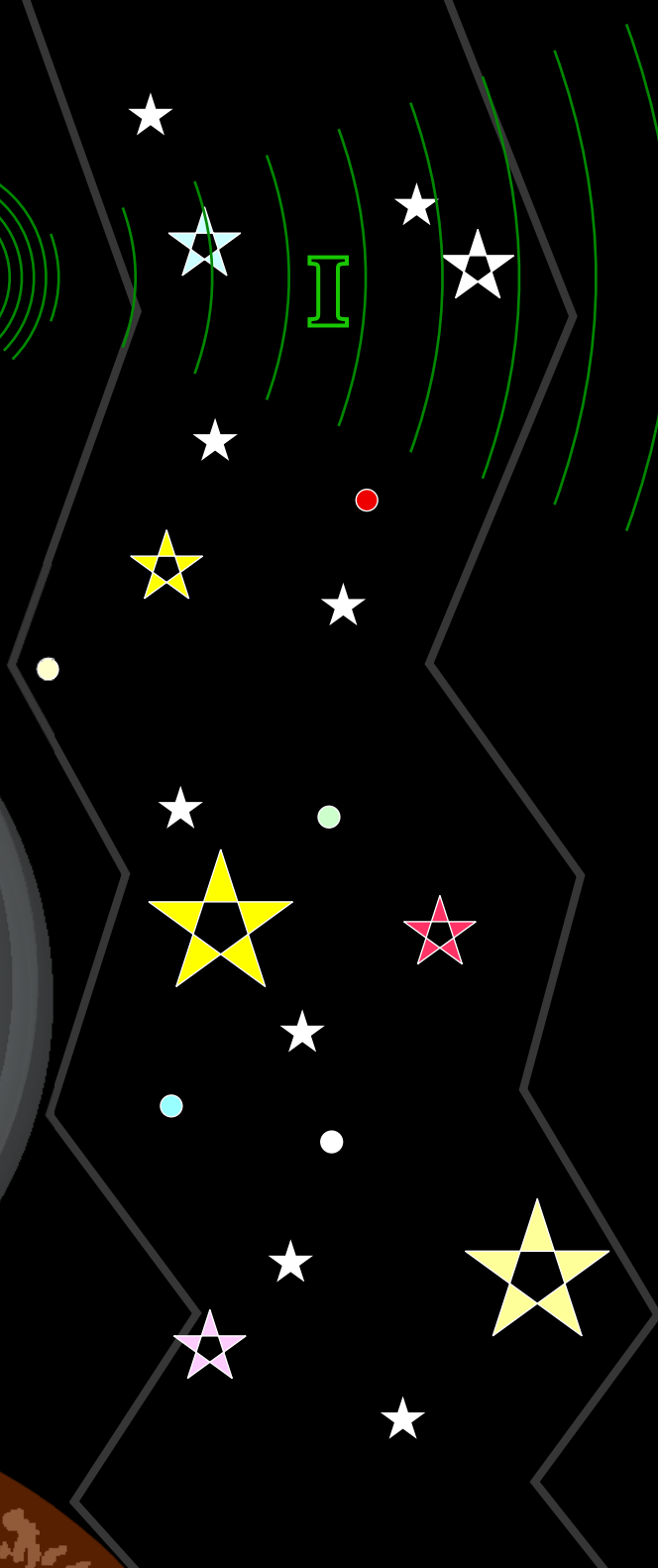
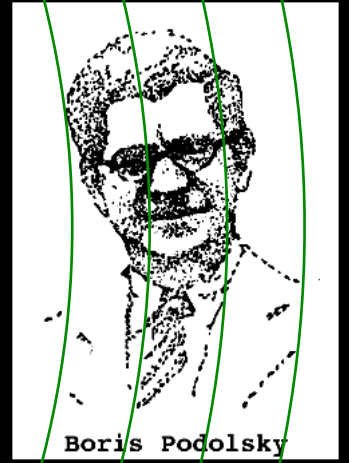
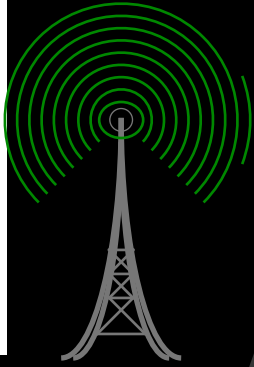


Albert Einstein

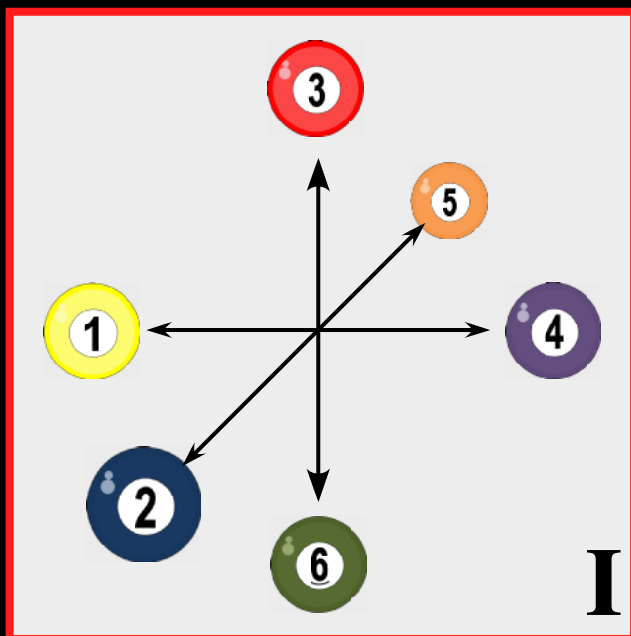


Boris Podolsky

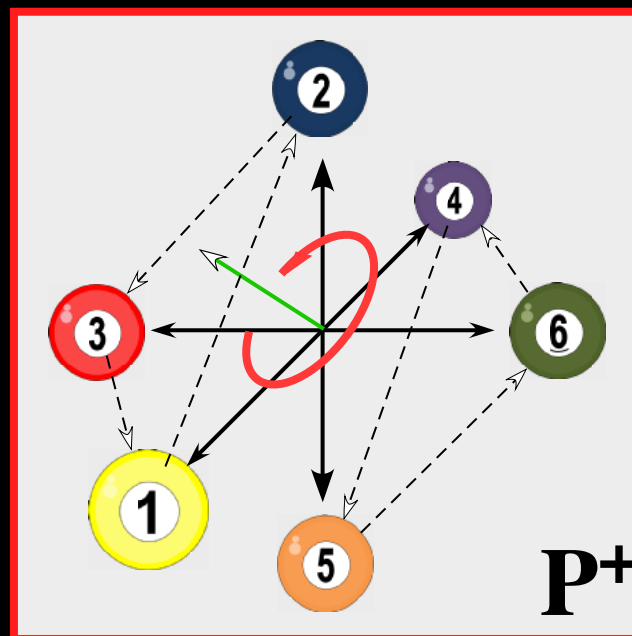




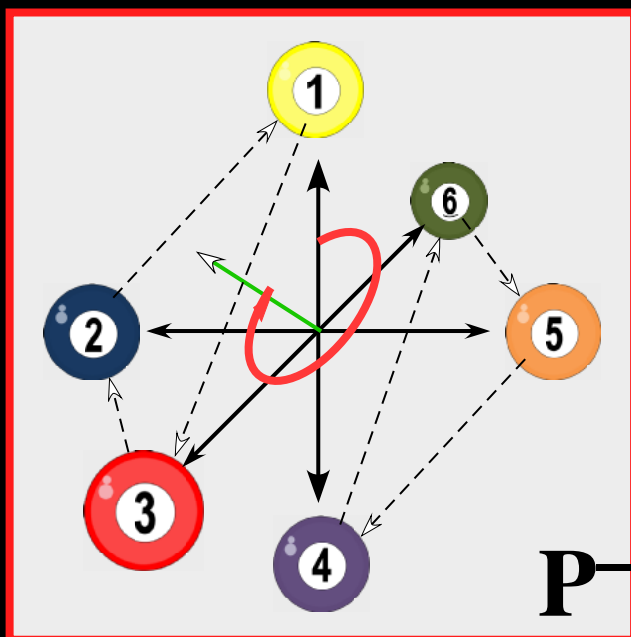
Permutations de Couleurs



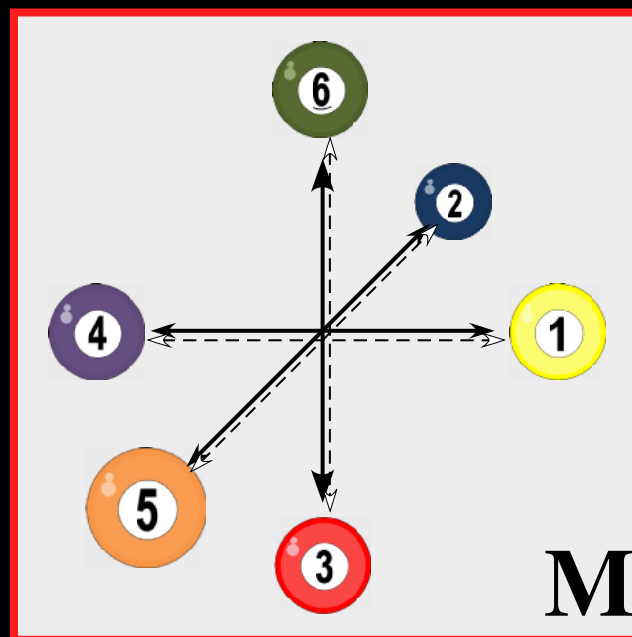
Identité



P⁺etit

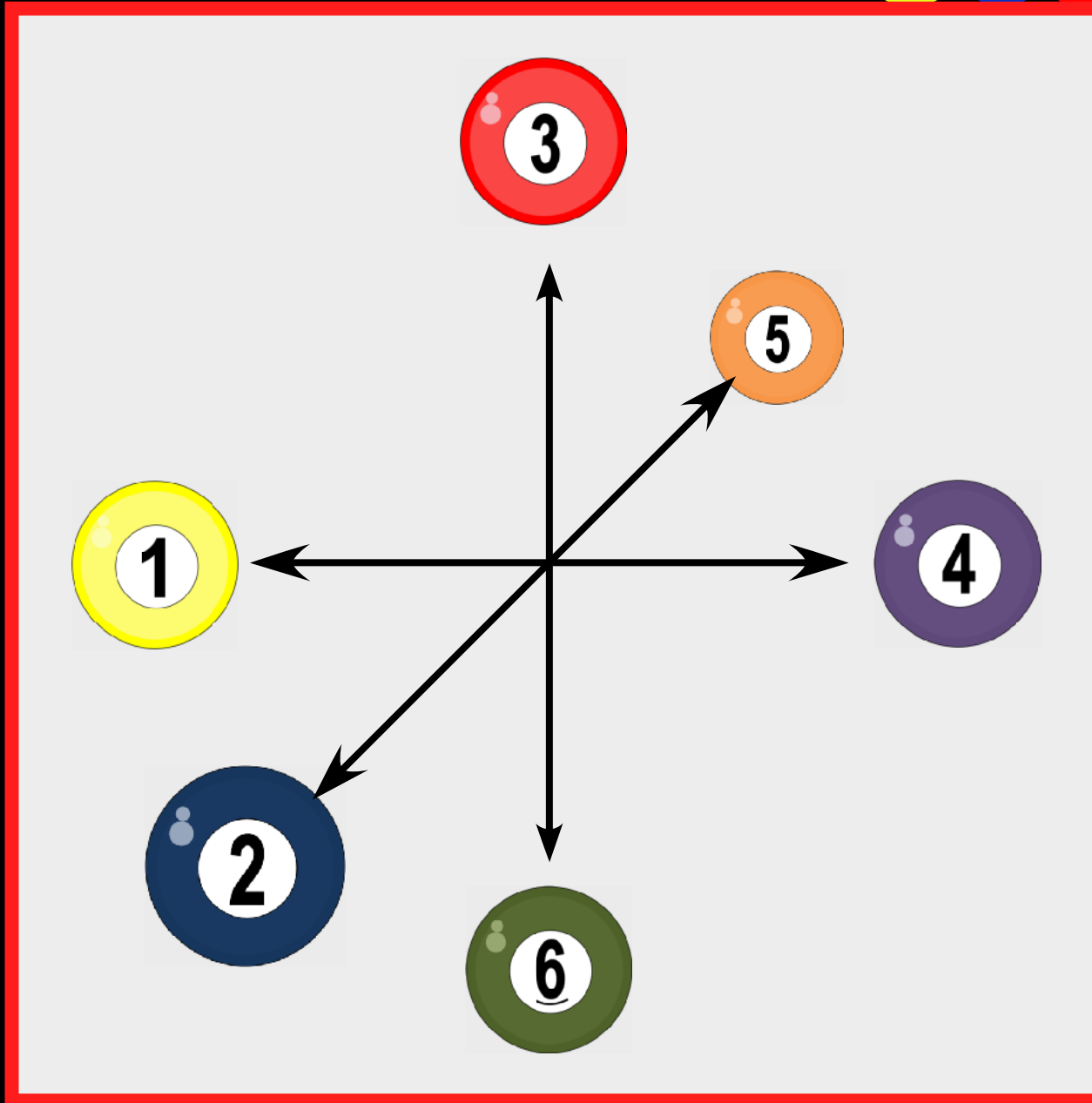


P⁻etit



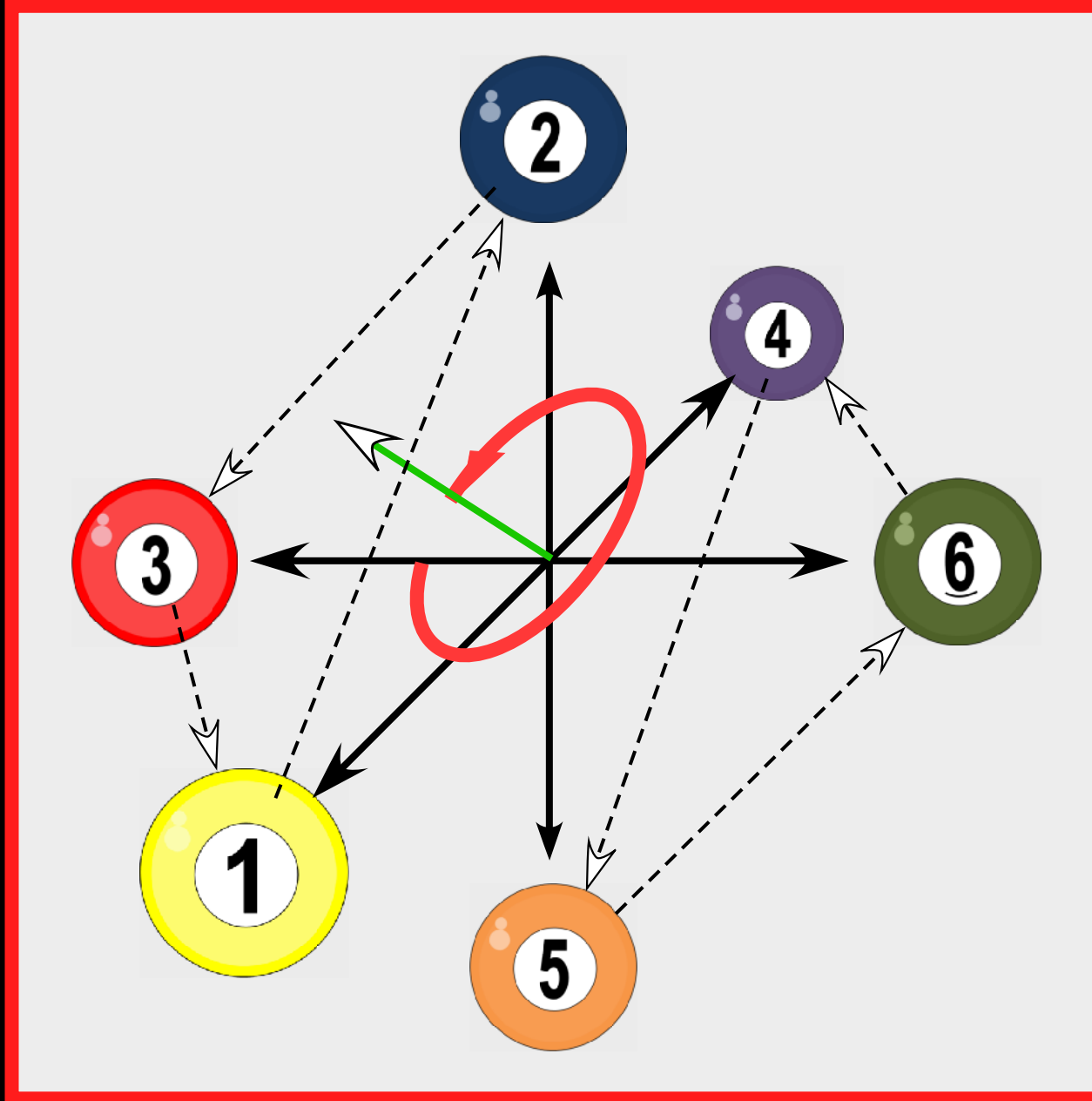
Mirroir

Permutations de Couleurs



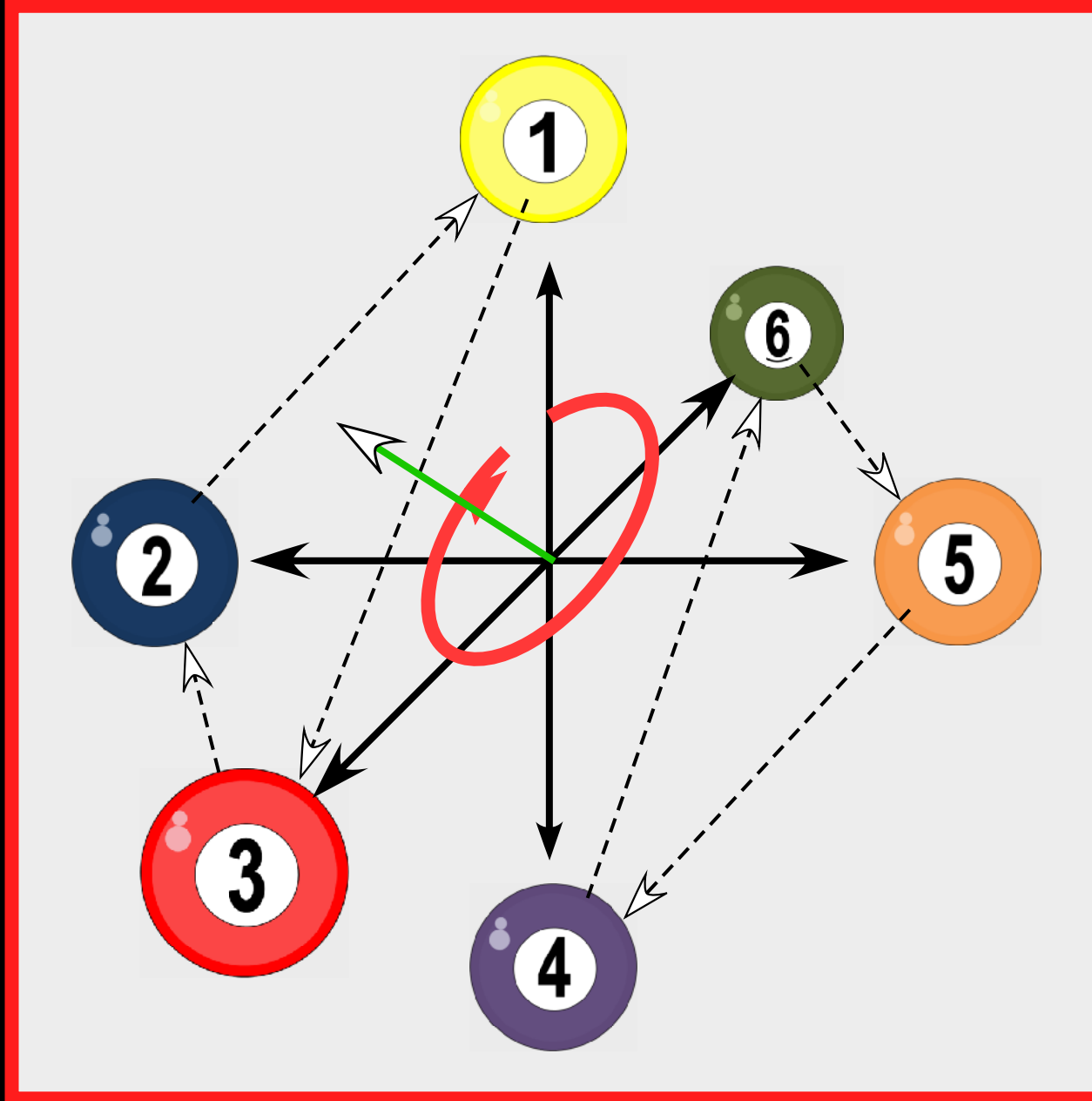
Identité

Permutations de Couleurs



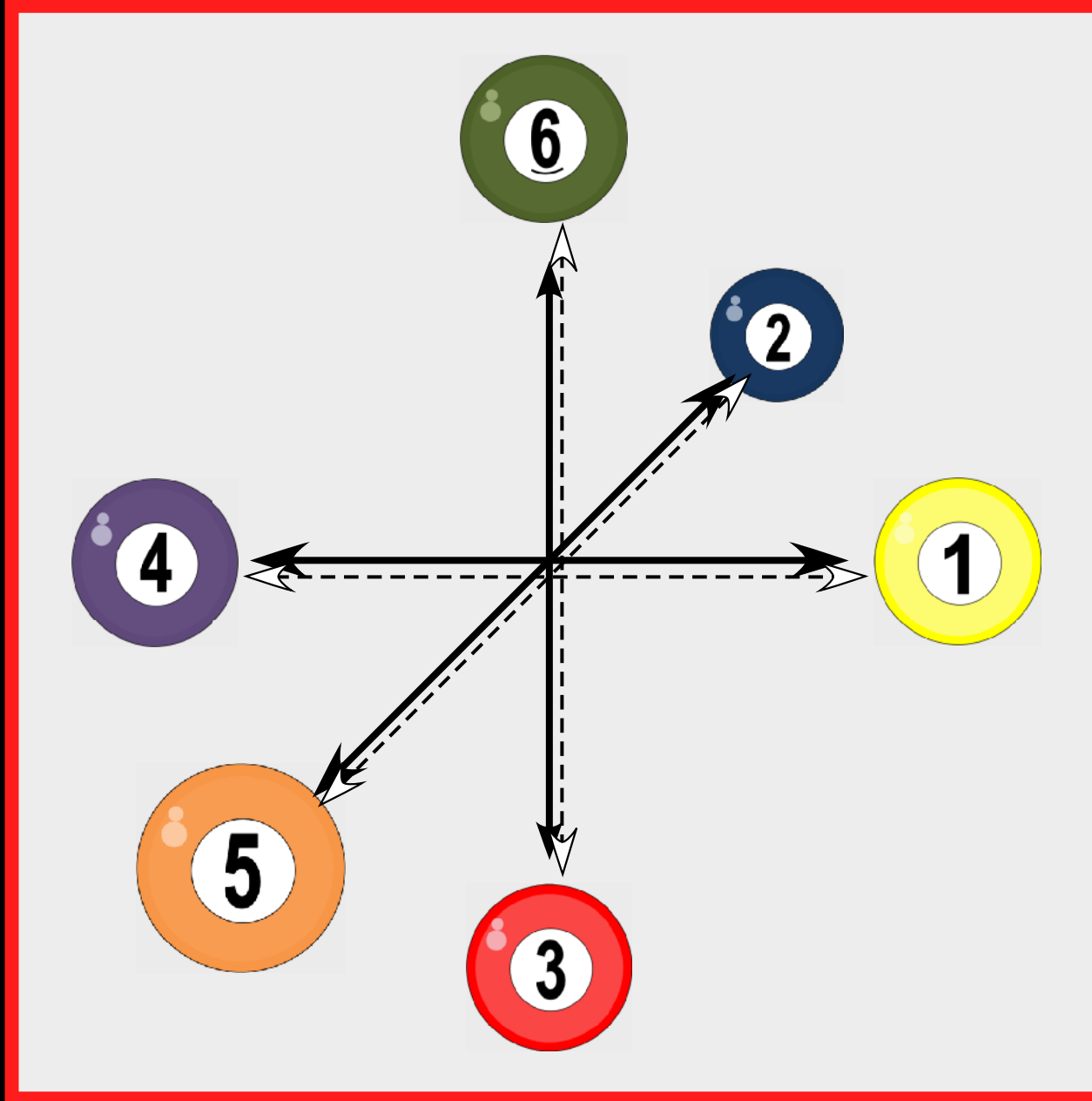
P⁺etit

Permutations de Couleurs

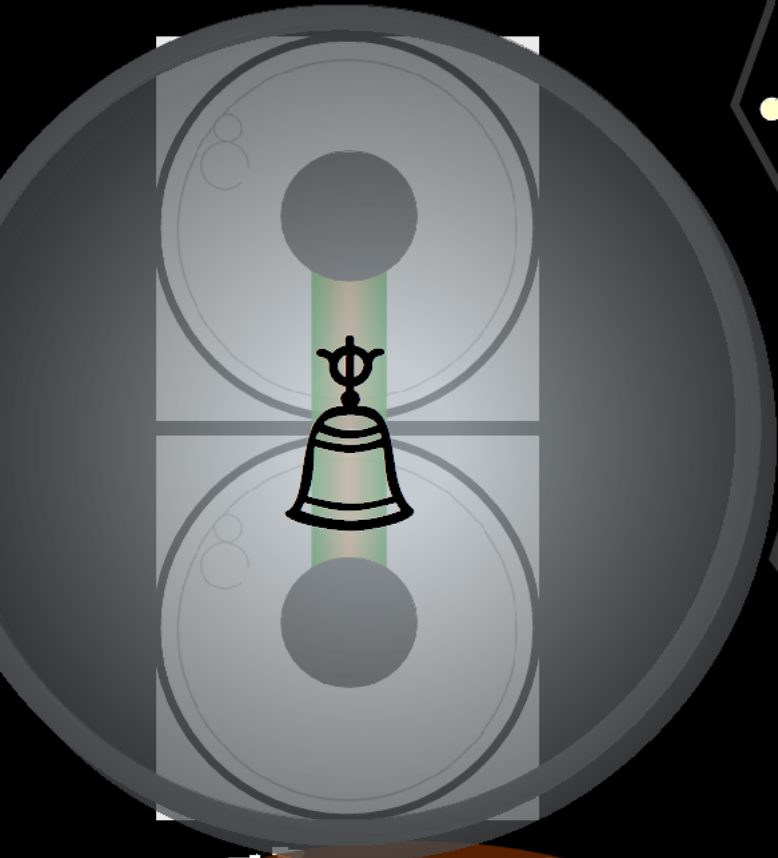
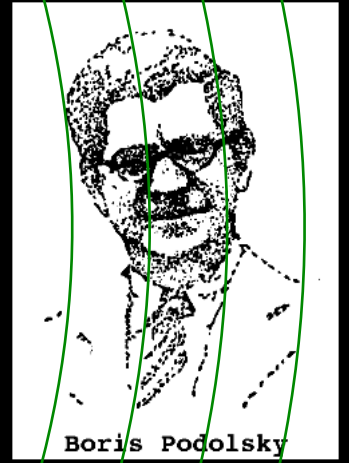
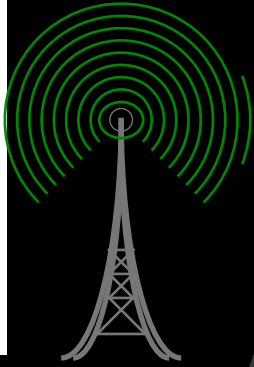


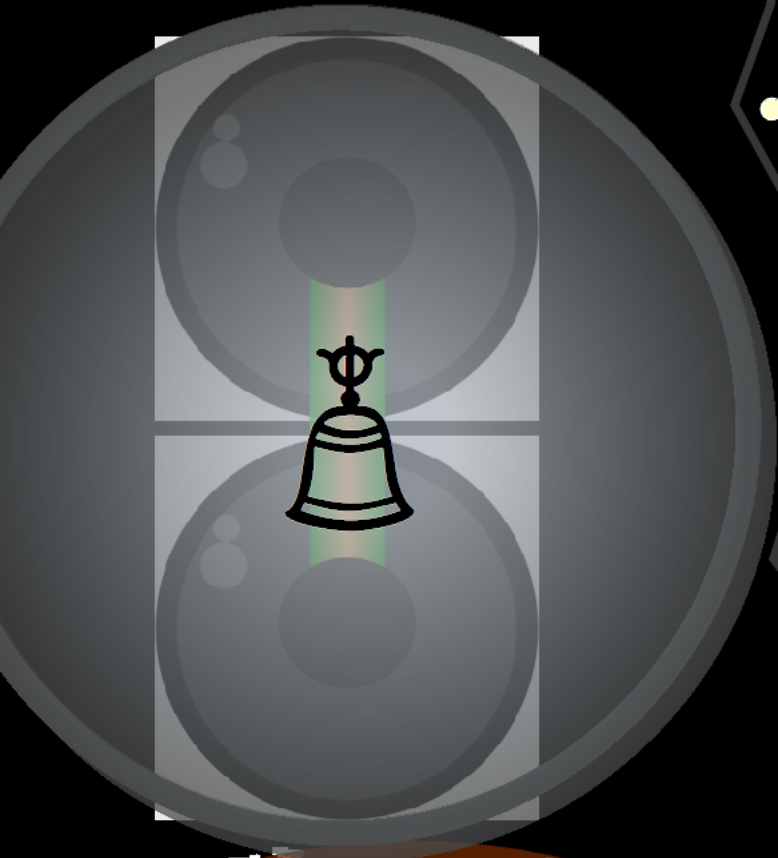
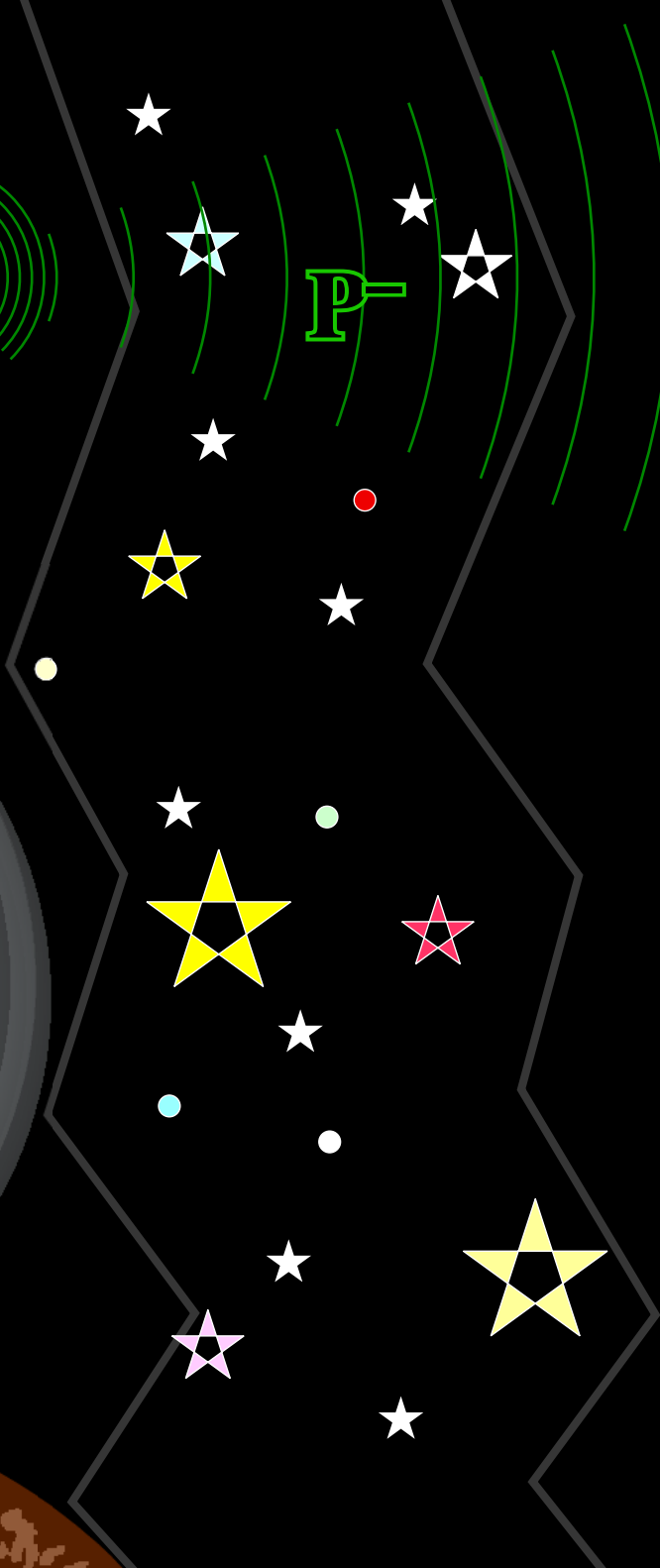
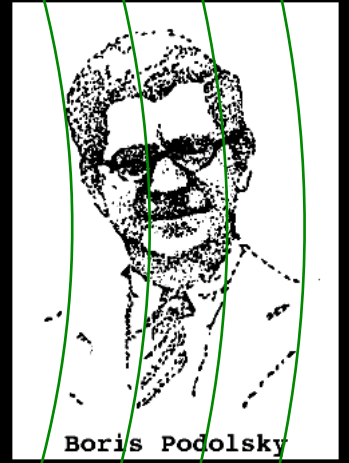
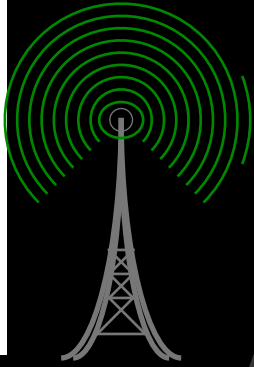
P-etit

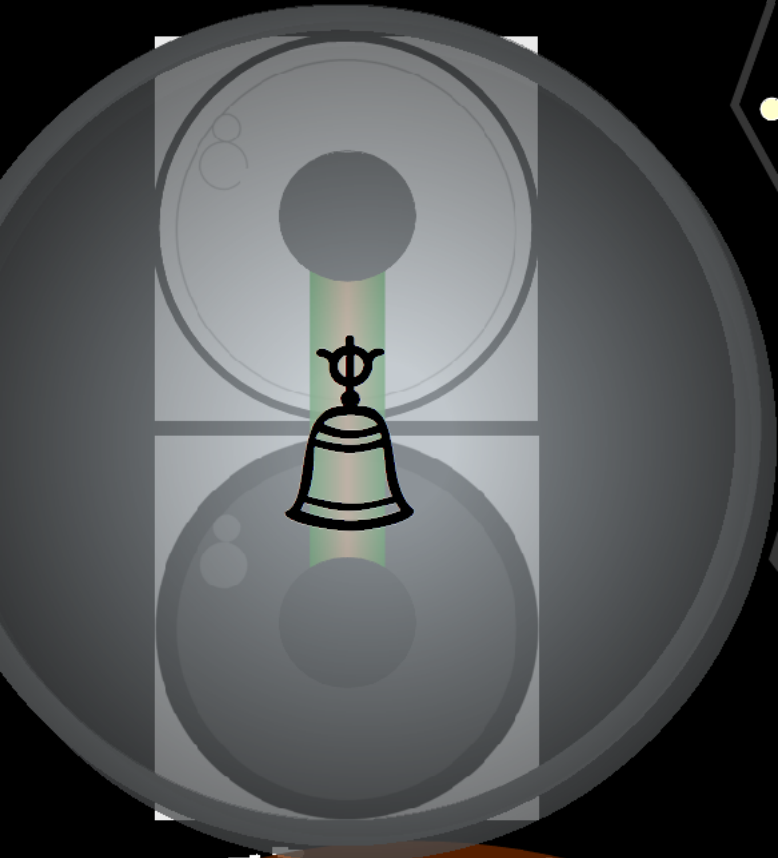
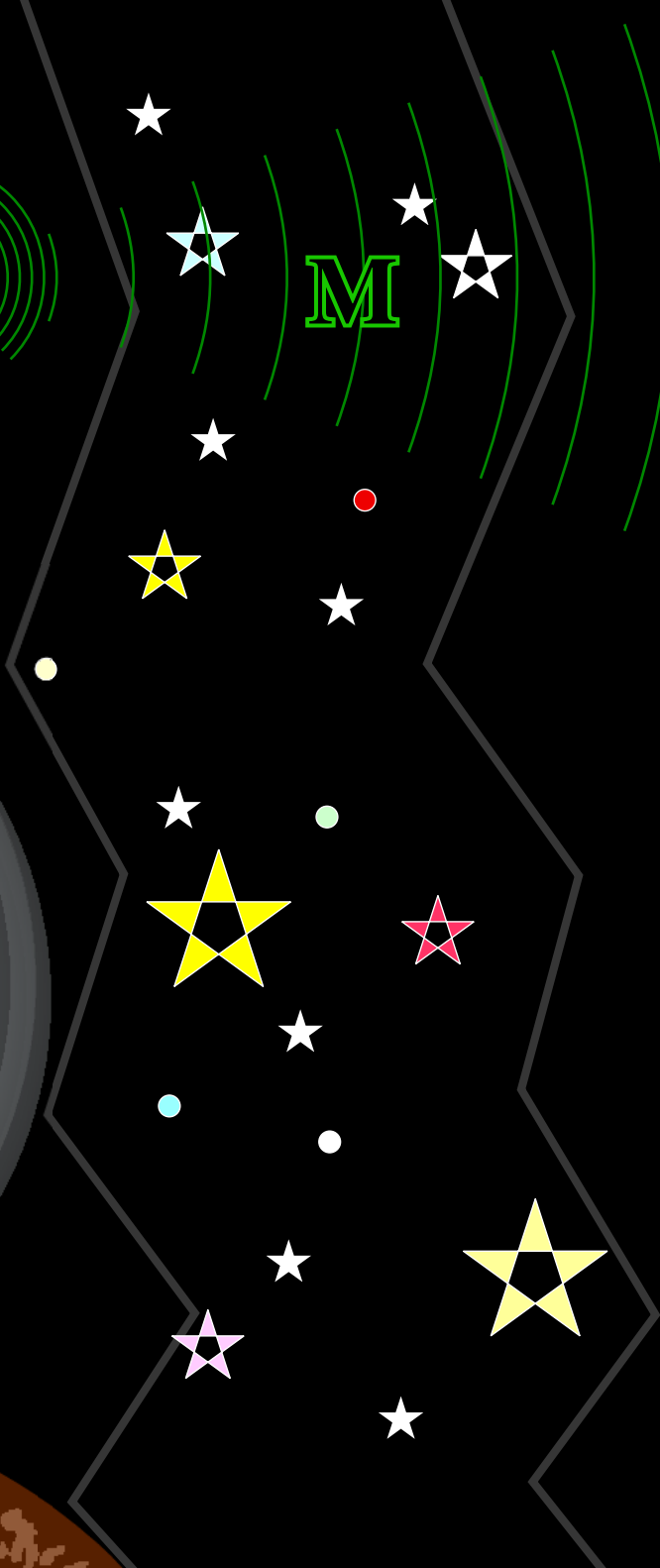
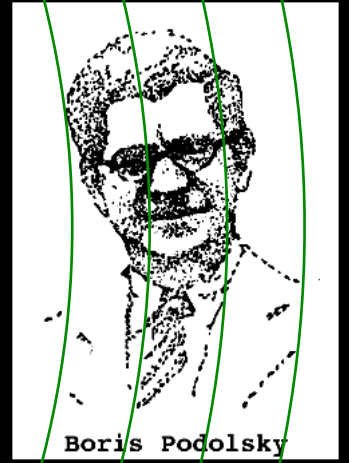
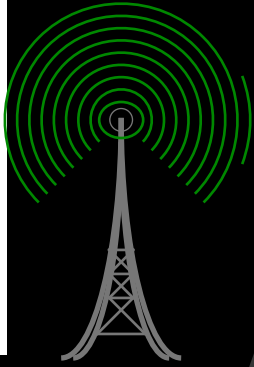
Permutations de Couleurs

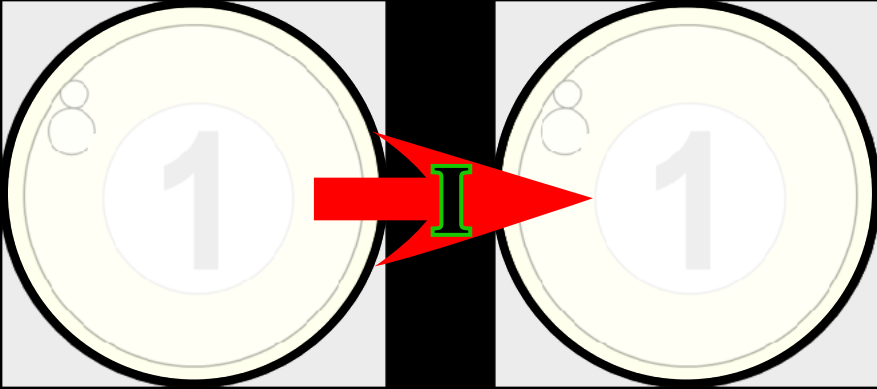
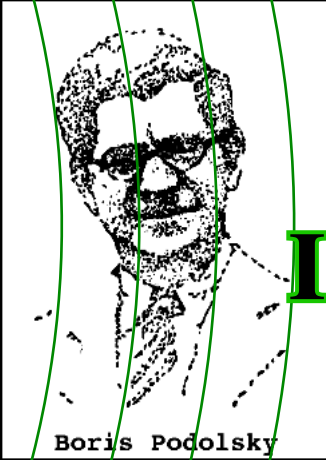


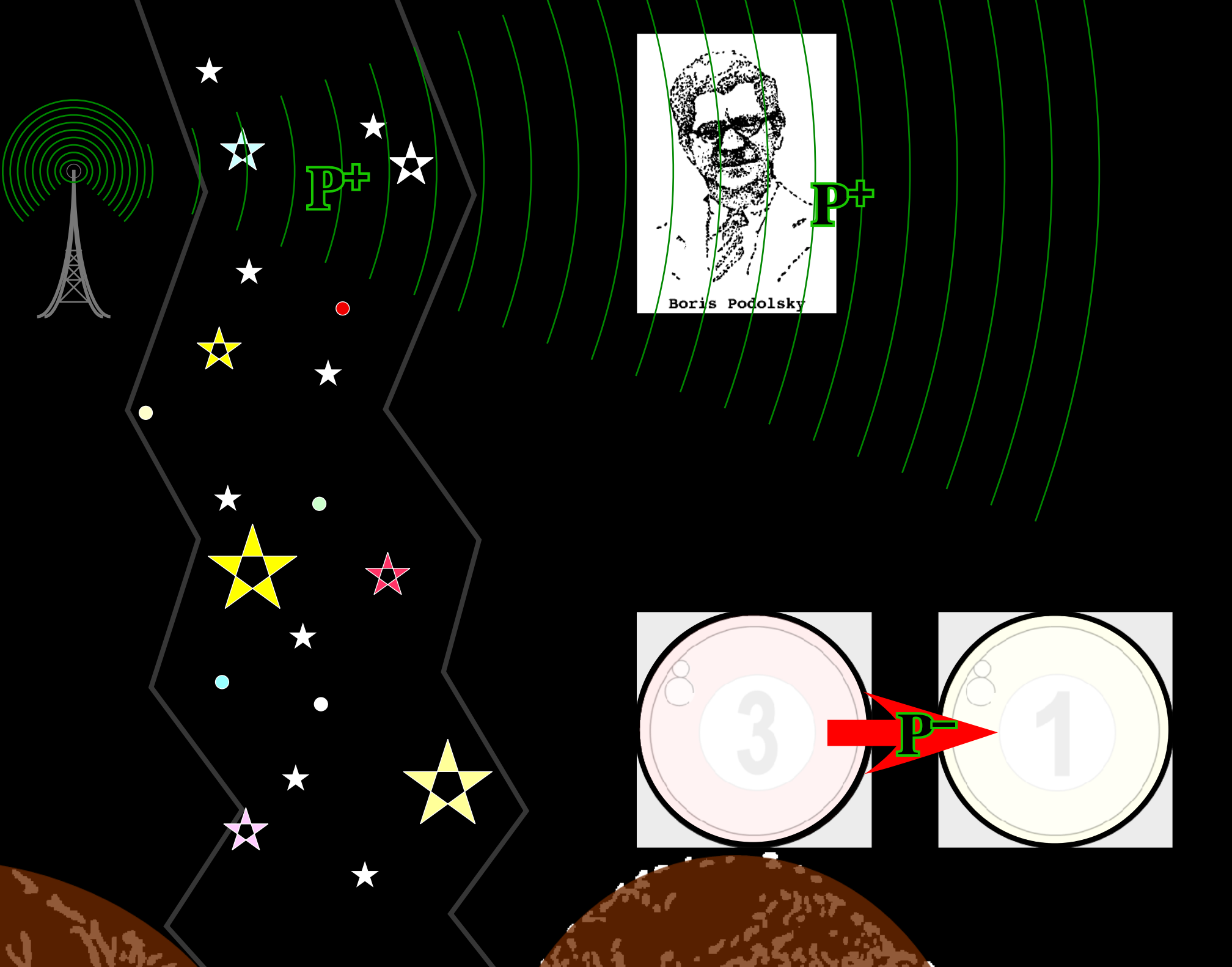
Mirroir





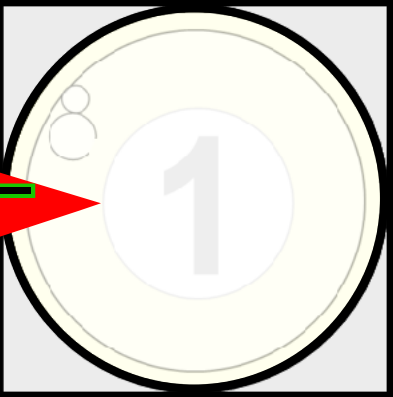
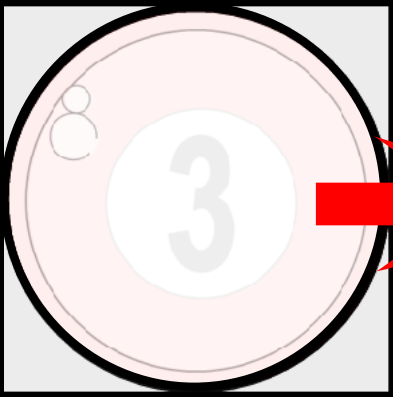
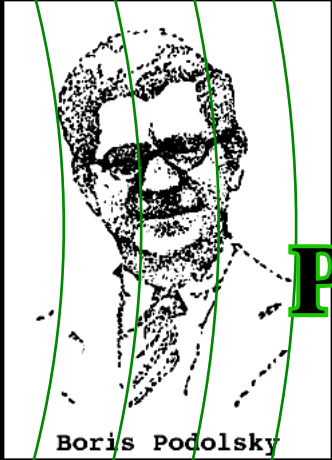


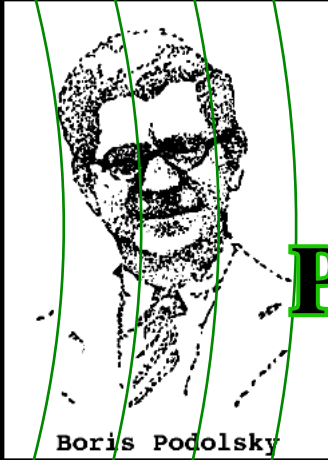
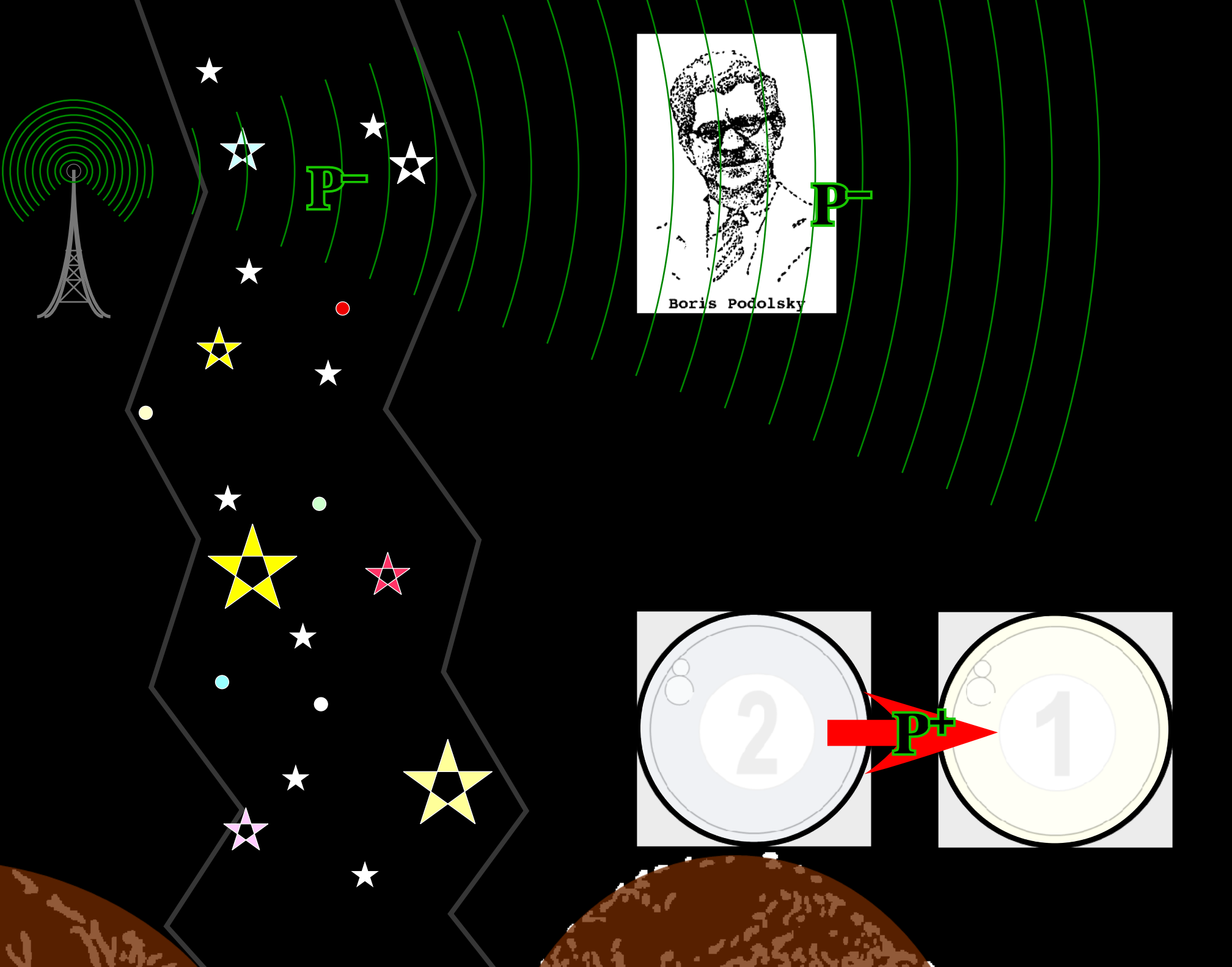




P+

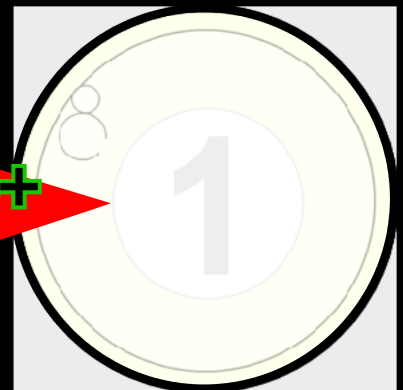
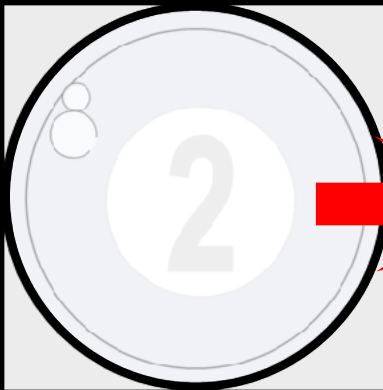
P+





P-

P-





M

M

Boris Podolsky

4

M

1

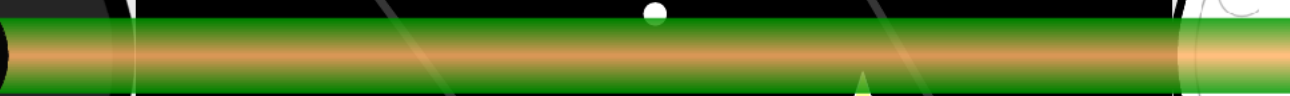
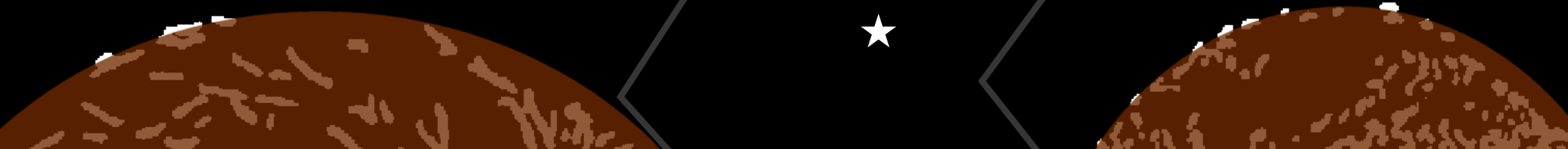
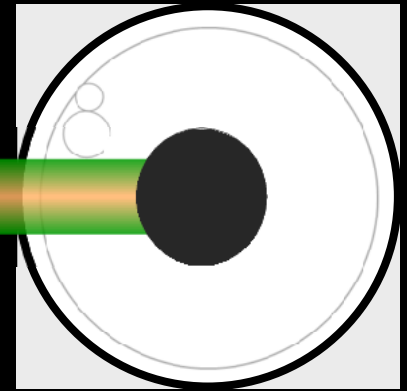
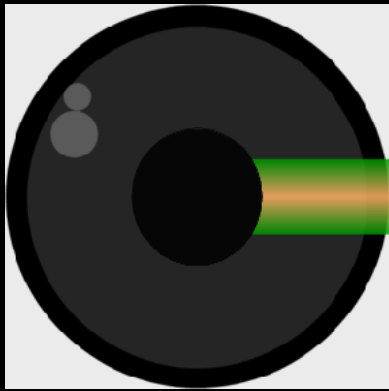
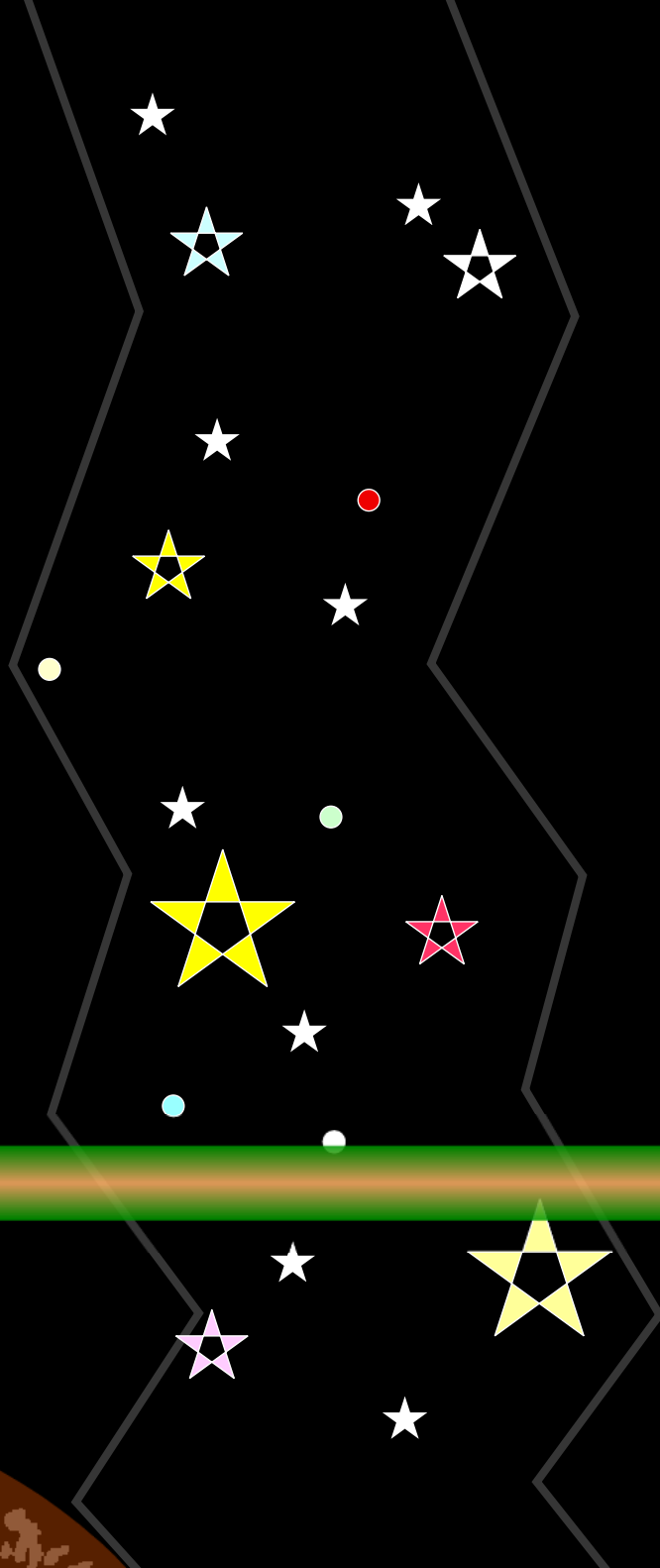
Téléportation: en général

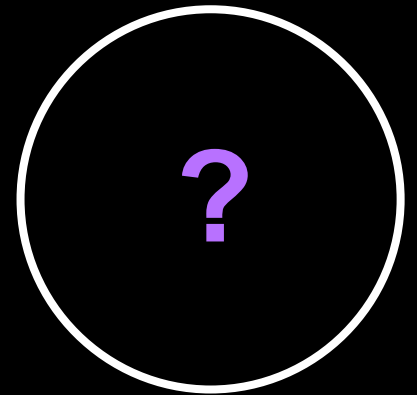
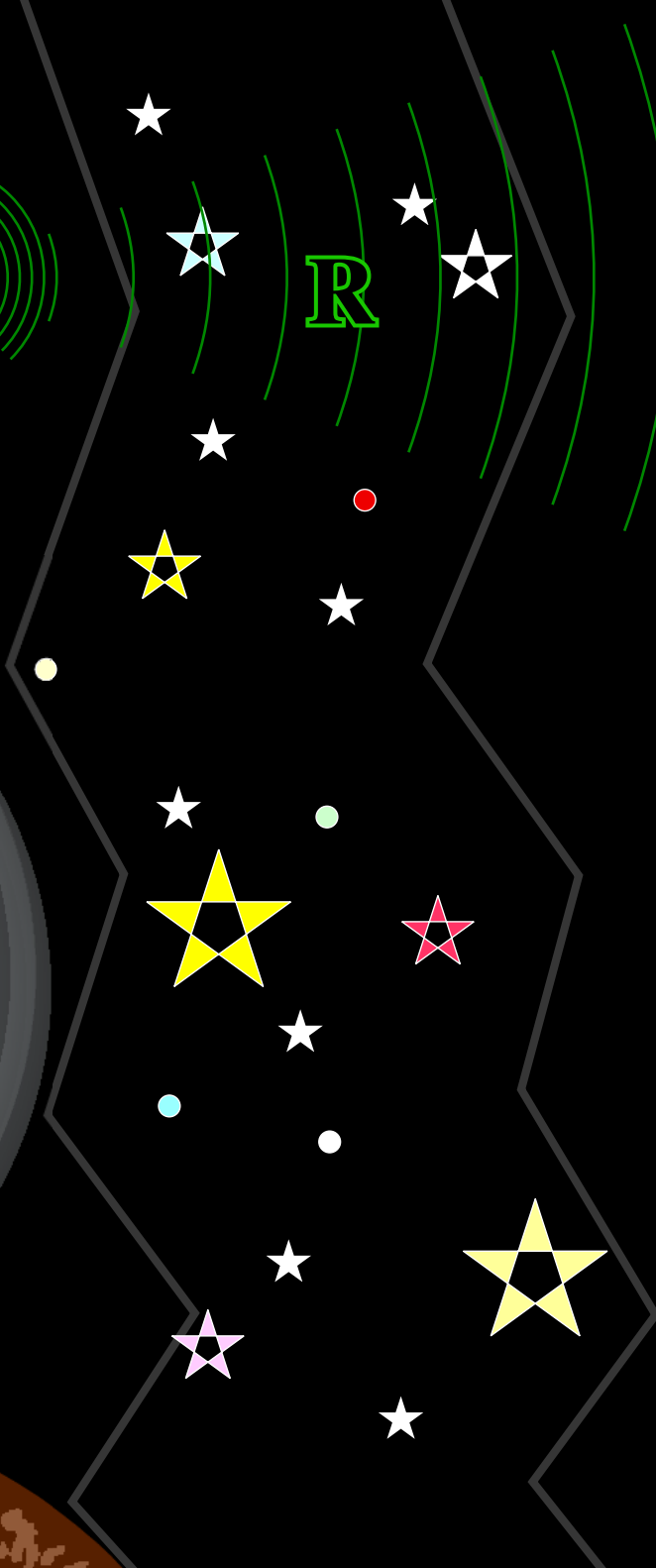
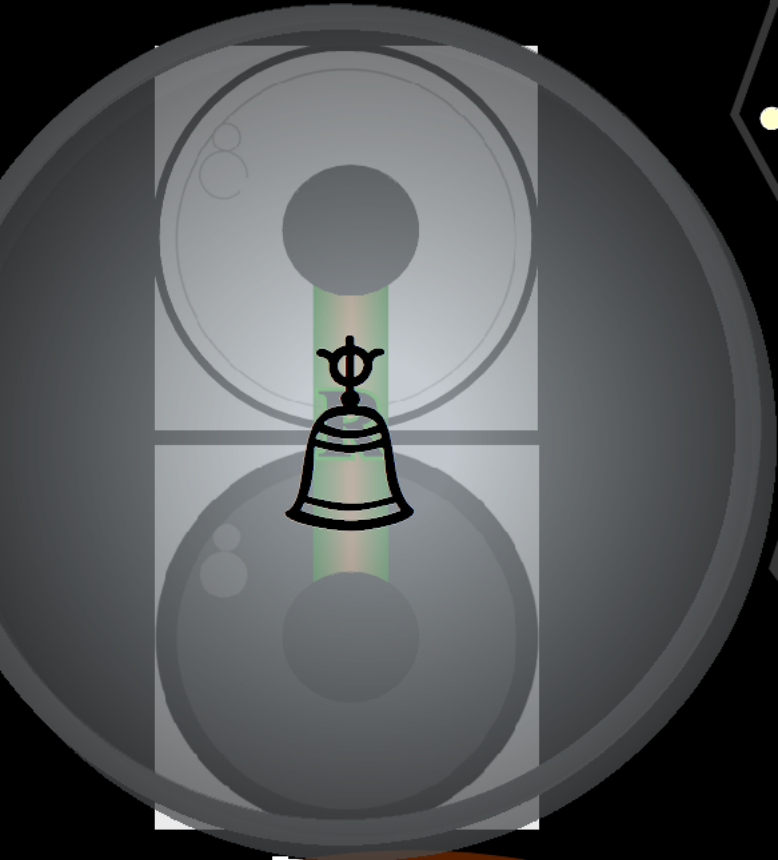
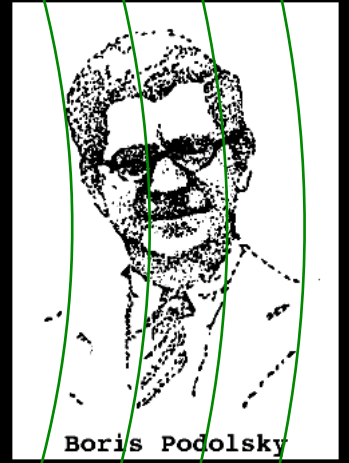
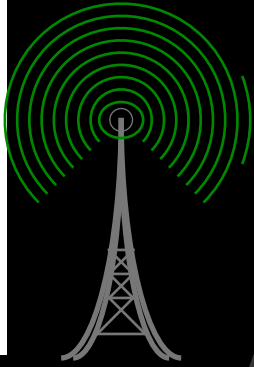


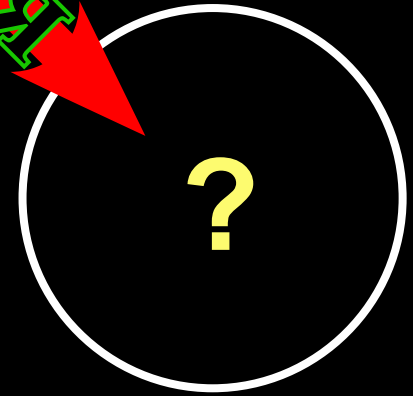
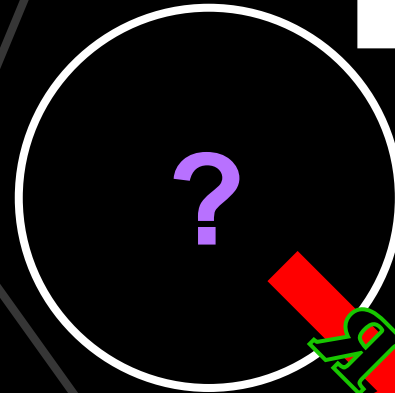
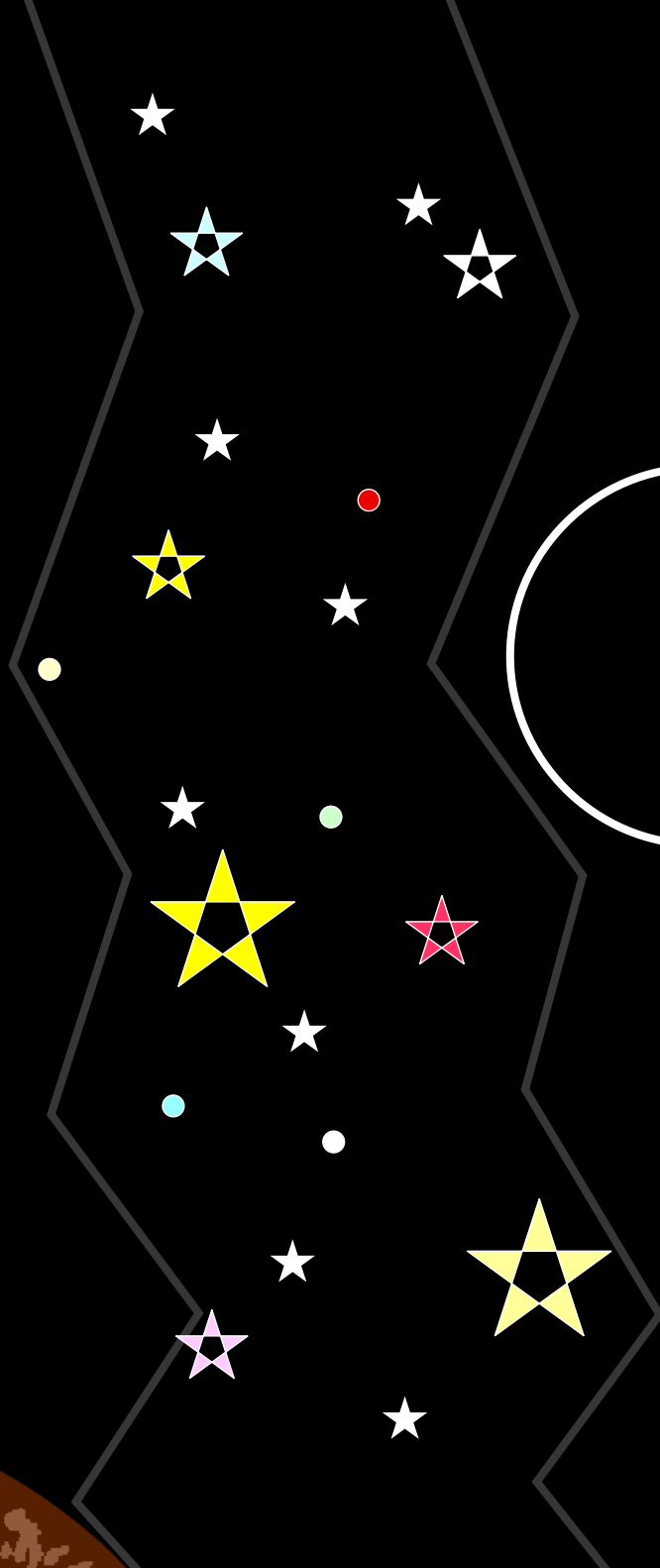
Albert Einstein

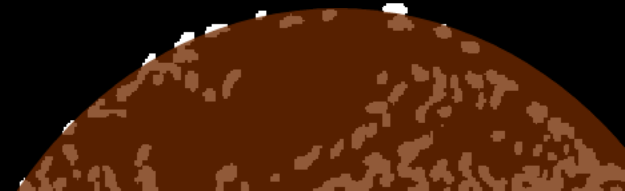
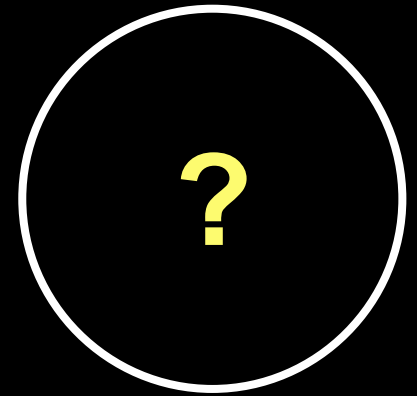
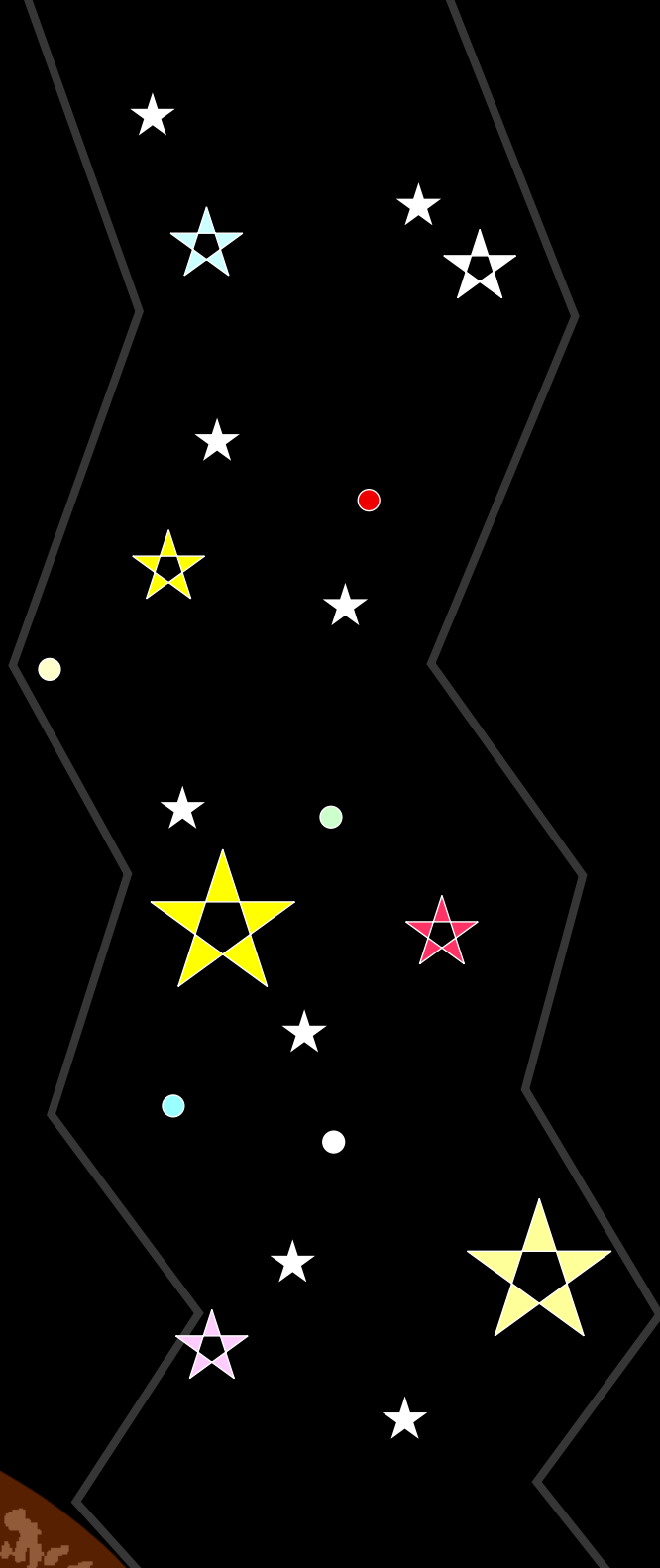


Boris Podolsky







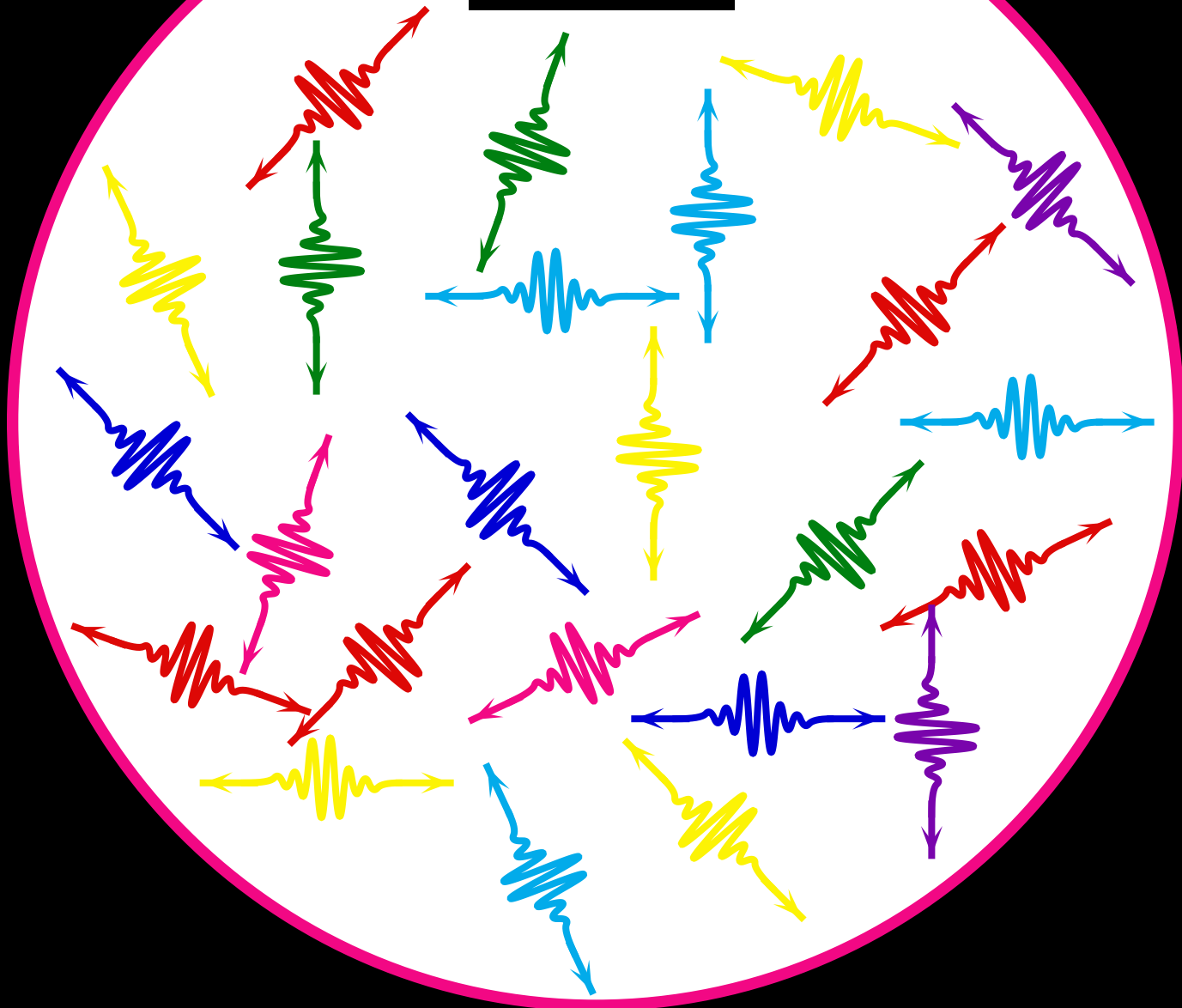


Polarisation: **un état quantique**

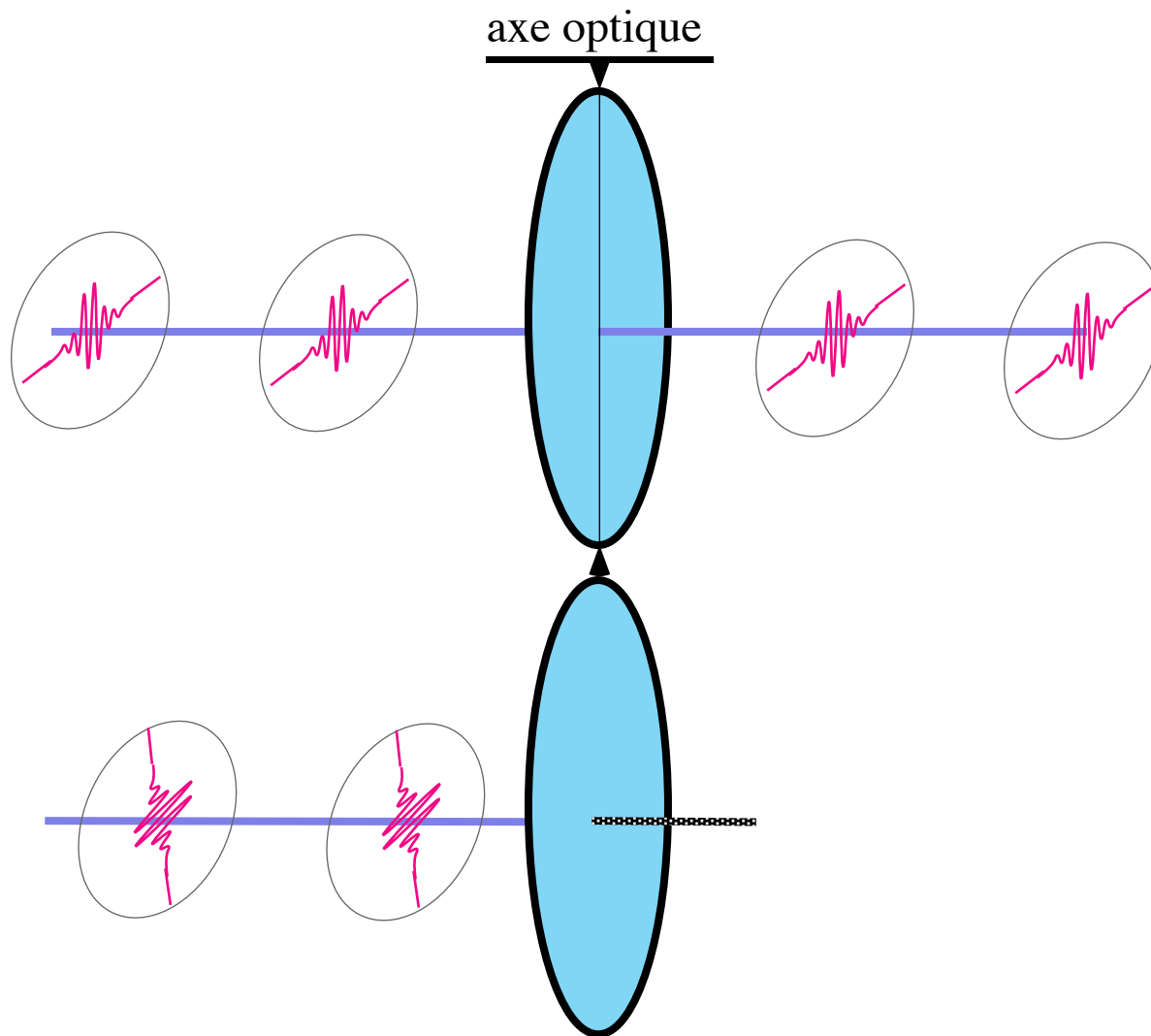
Photons



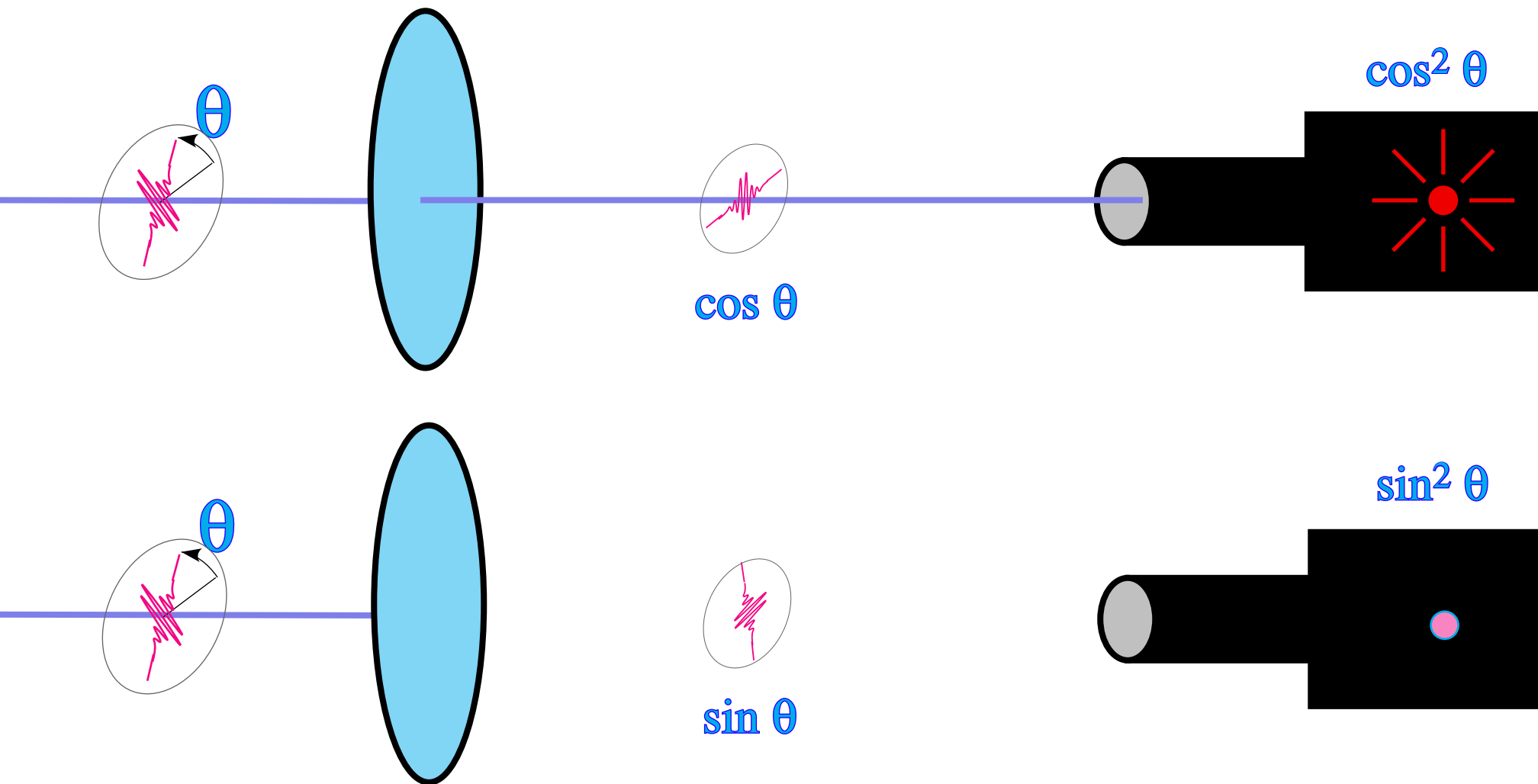
Photons



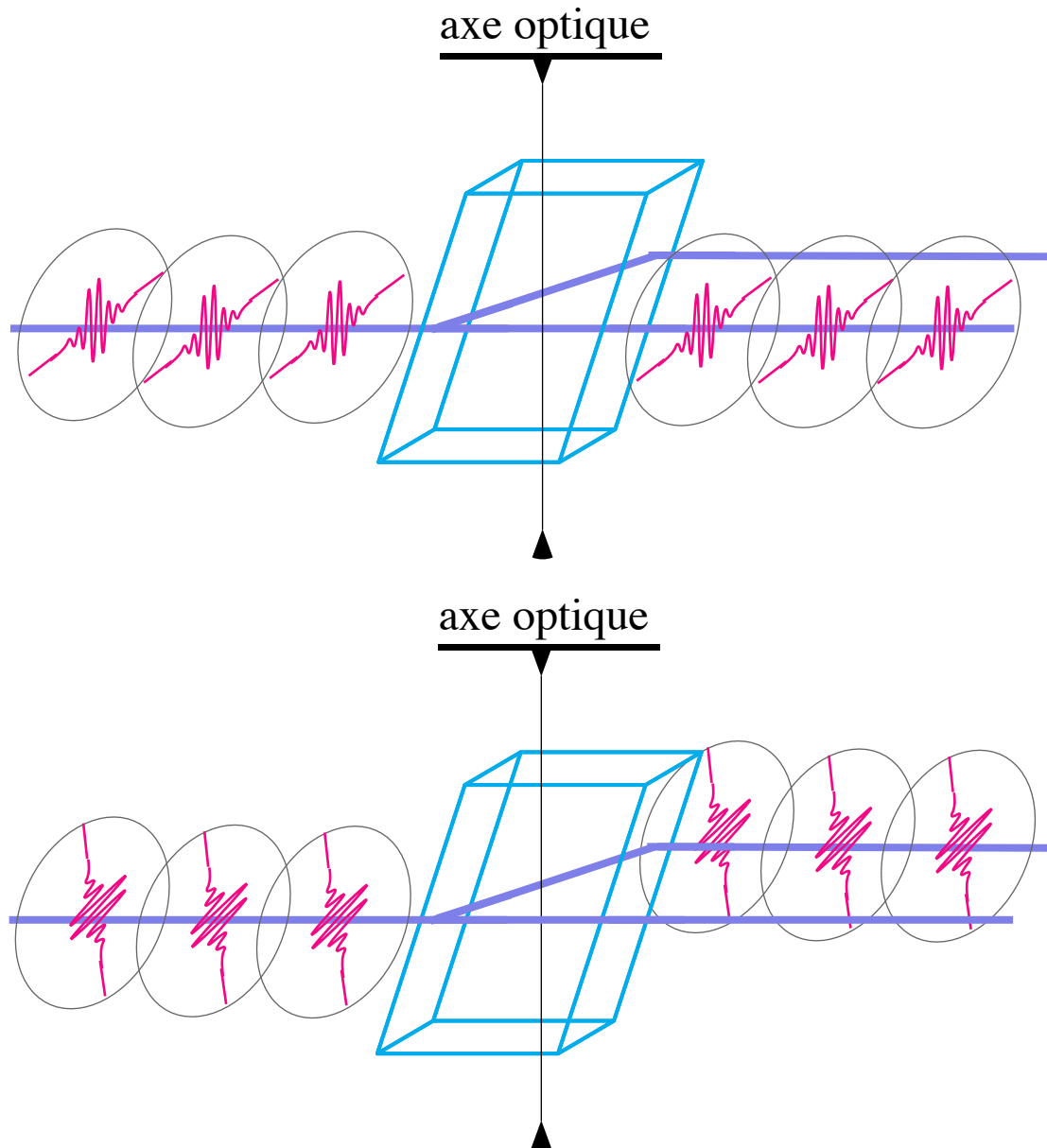
Filtre Polarisant



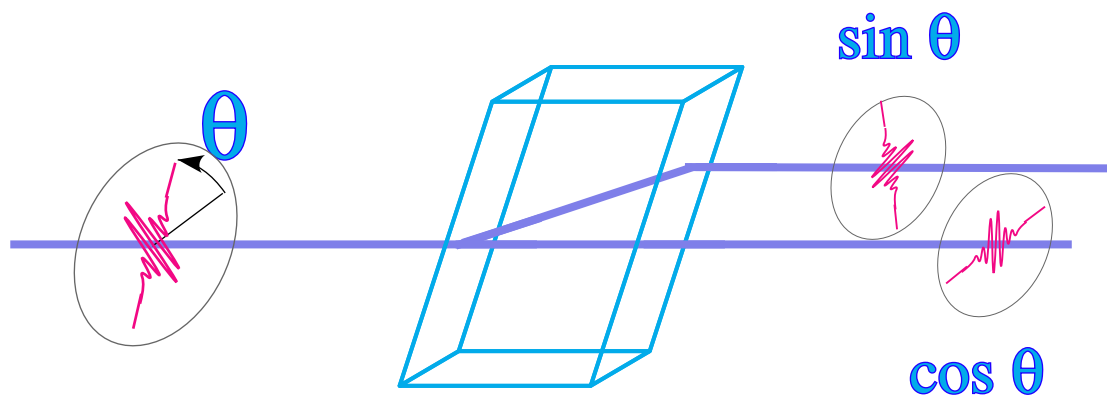
Filtre Polarisant et photodecteurs



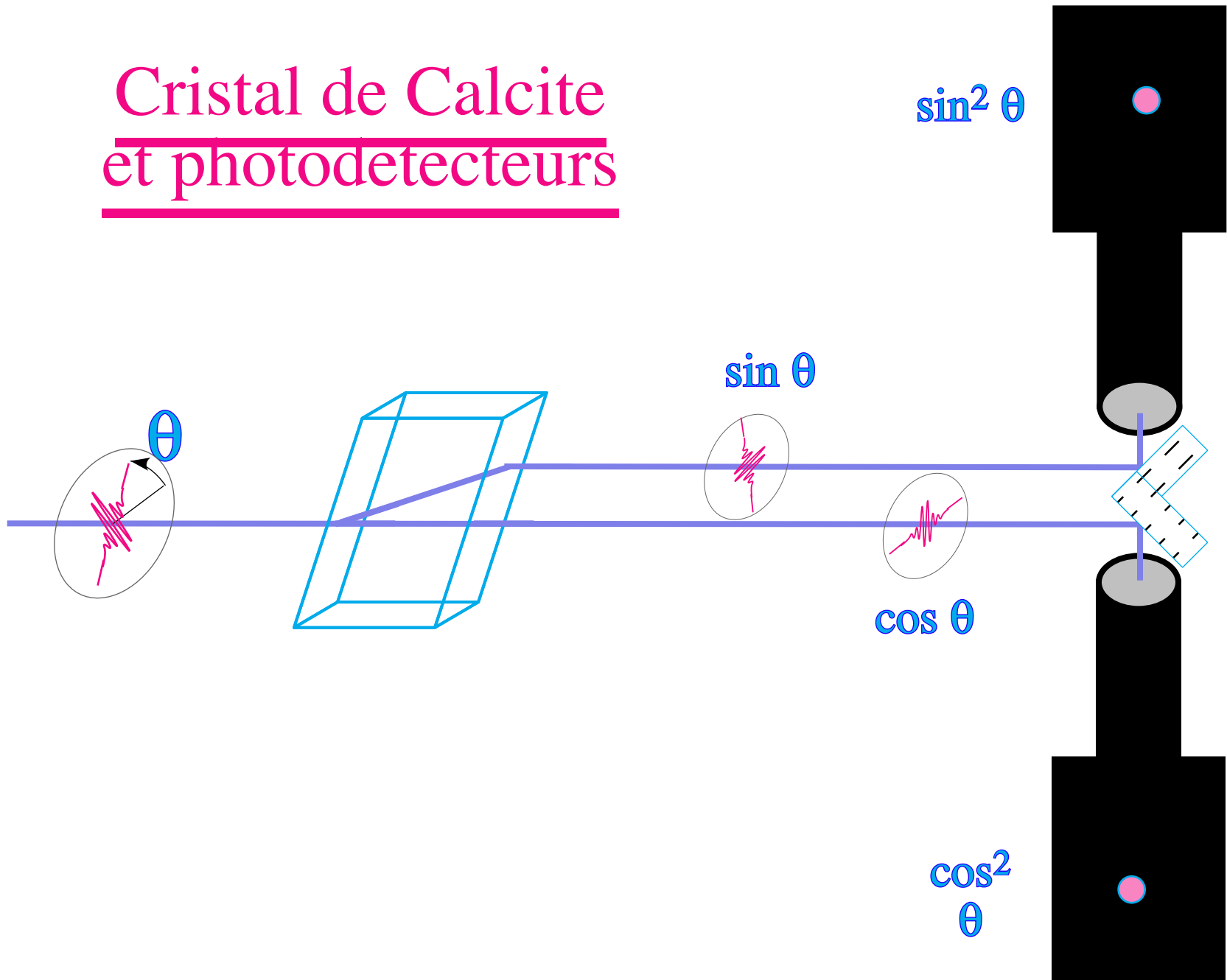
Cristal de Calcite



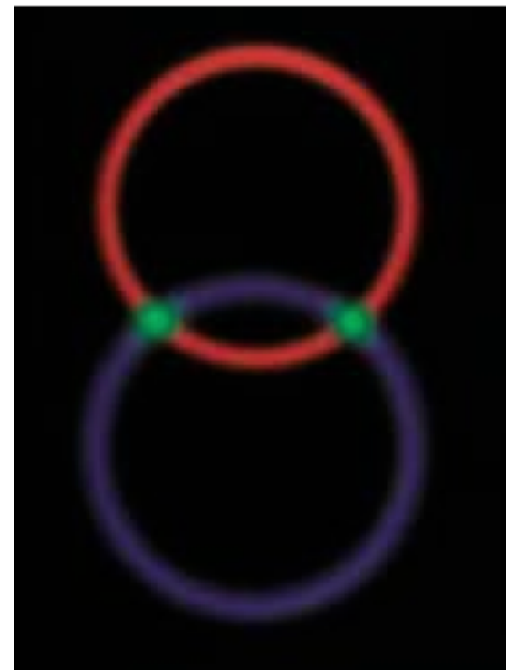
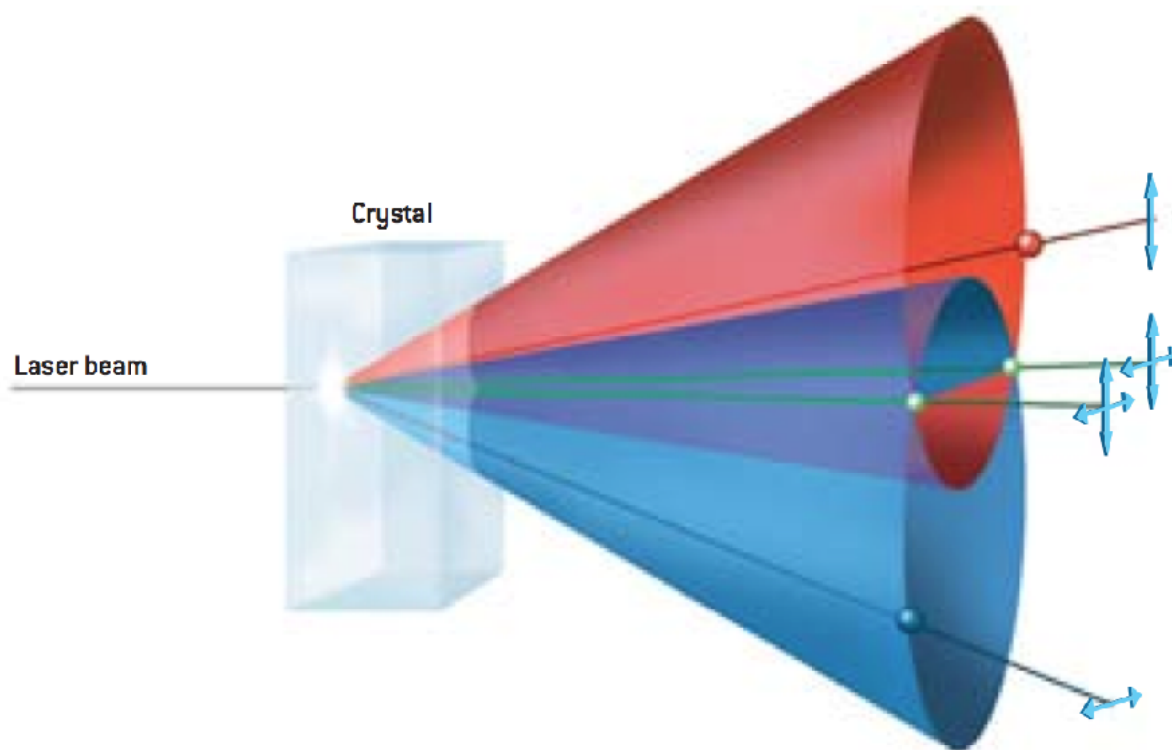
Cristal de Calcite



Cristal de Calcite et photodetecteurs

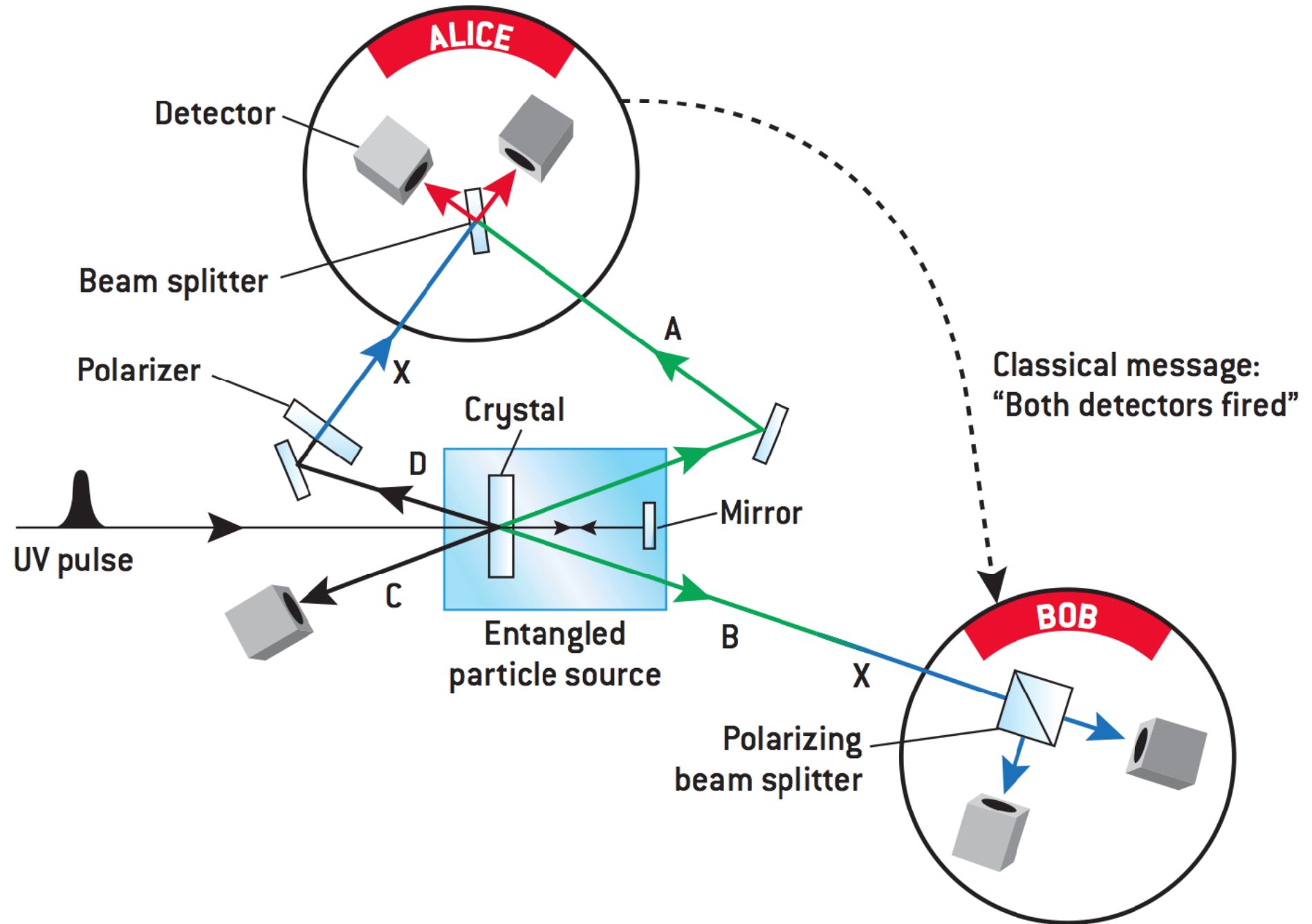


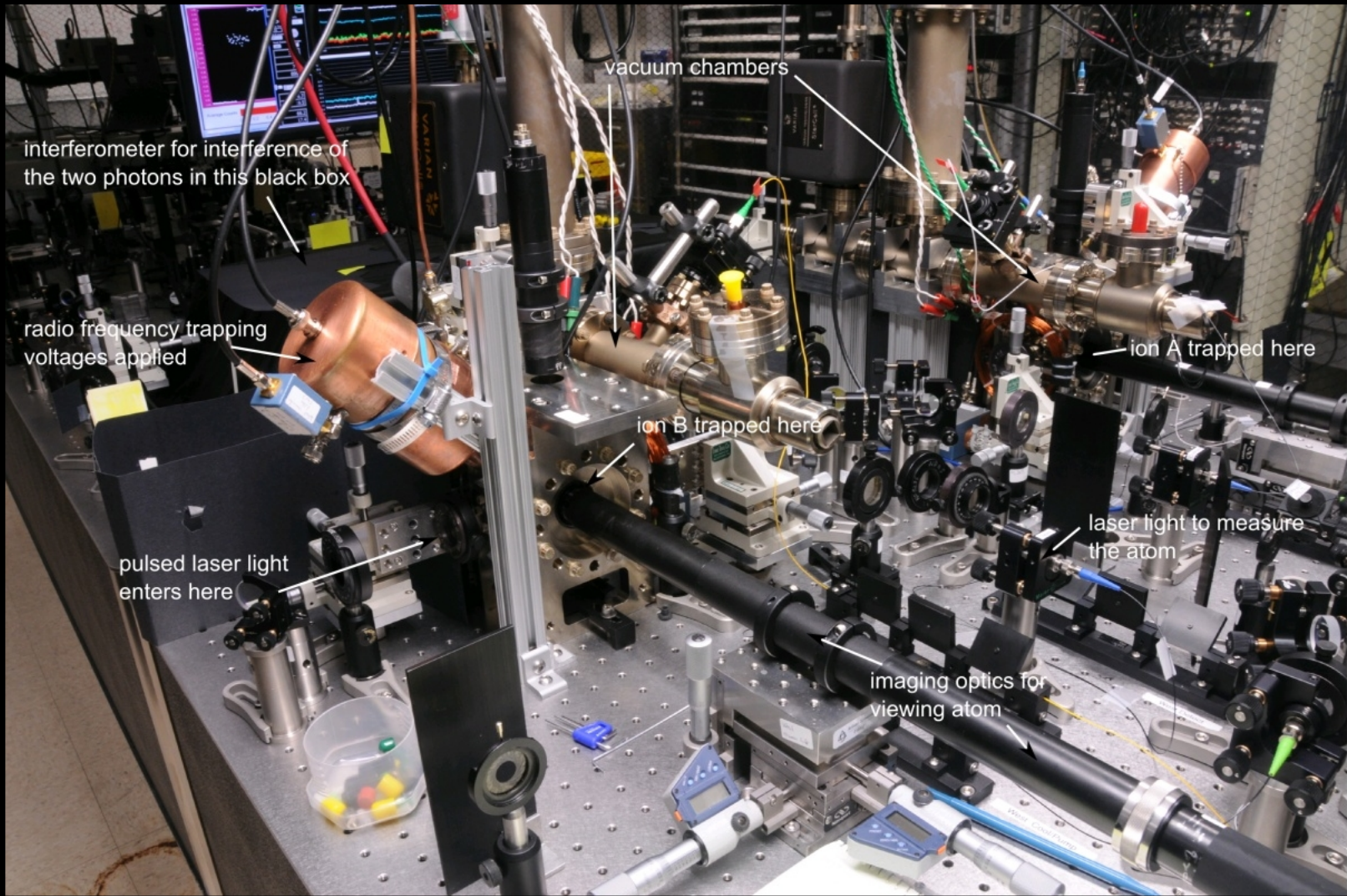
Génération de paires EPR



LAURIE GRACE (left); P. G. KWIAT AND M. RECK
Institute for Experimental Physics, University of Vienna (right)

L'Experience d'Innsbruck





interferometer for interference of the two photons in this black box

radio frequency trapping voltages applied

pulsed laser light enters here

vacuum chambers

ion B trapped here

imaging optics for viewing atom

laser light to measure the atom

ion A trapped here

Applications

Préparation de la téléportation...



...Mesure quantique...



...Transmission des données aléatoires...



...Reconstruction du voyageur.



< Airport Exit
< Baggage
< Hover Cabs
< Skyway
< Rentals

QUANTUM TRANSPORT ANALYZER
10:25 AM - 11 April 2090

QUANTUM BALANCE
QUANTUM DECAY
QUANTUM LOCK
QUANTUM SENSITIVE
QUANTUM FACTOR



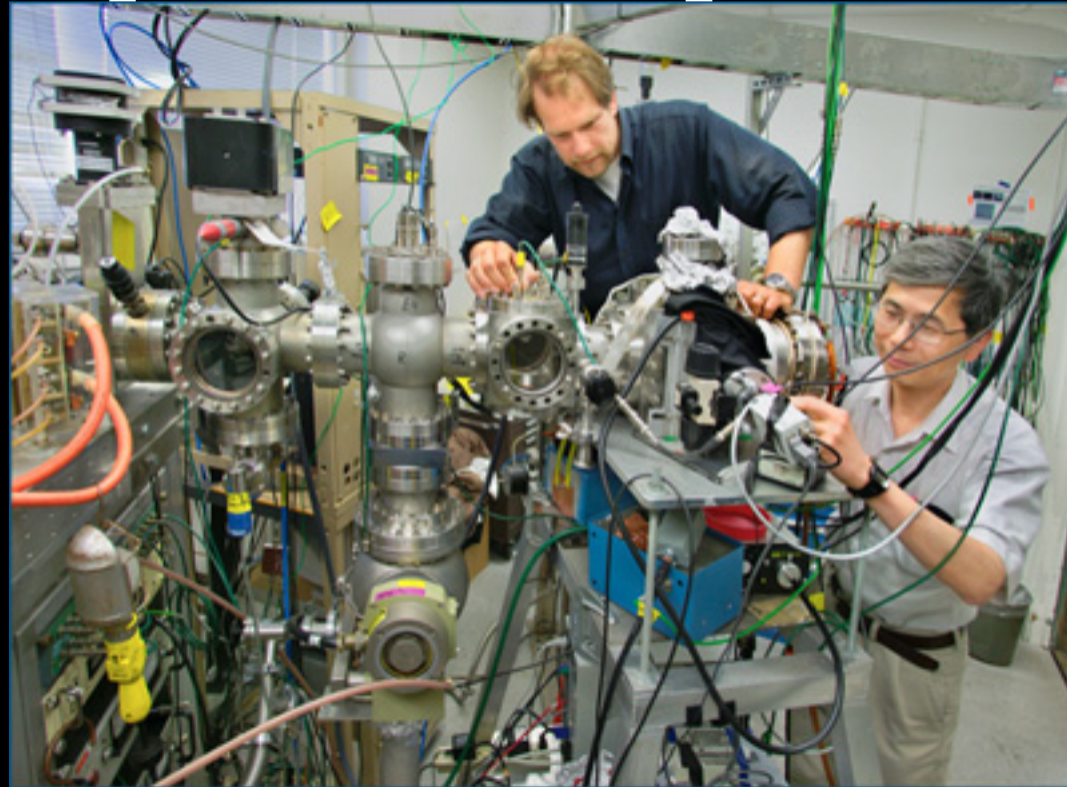
NEW YORK
QUANTUM
TRANSIT
AUTHORITY



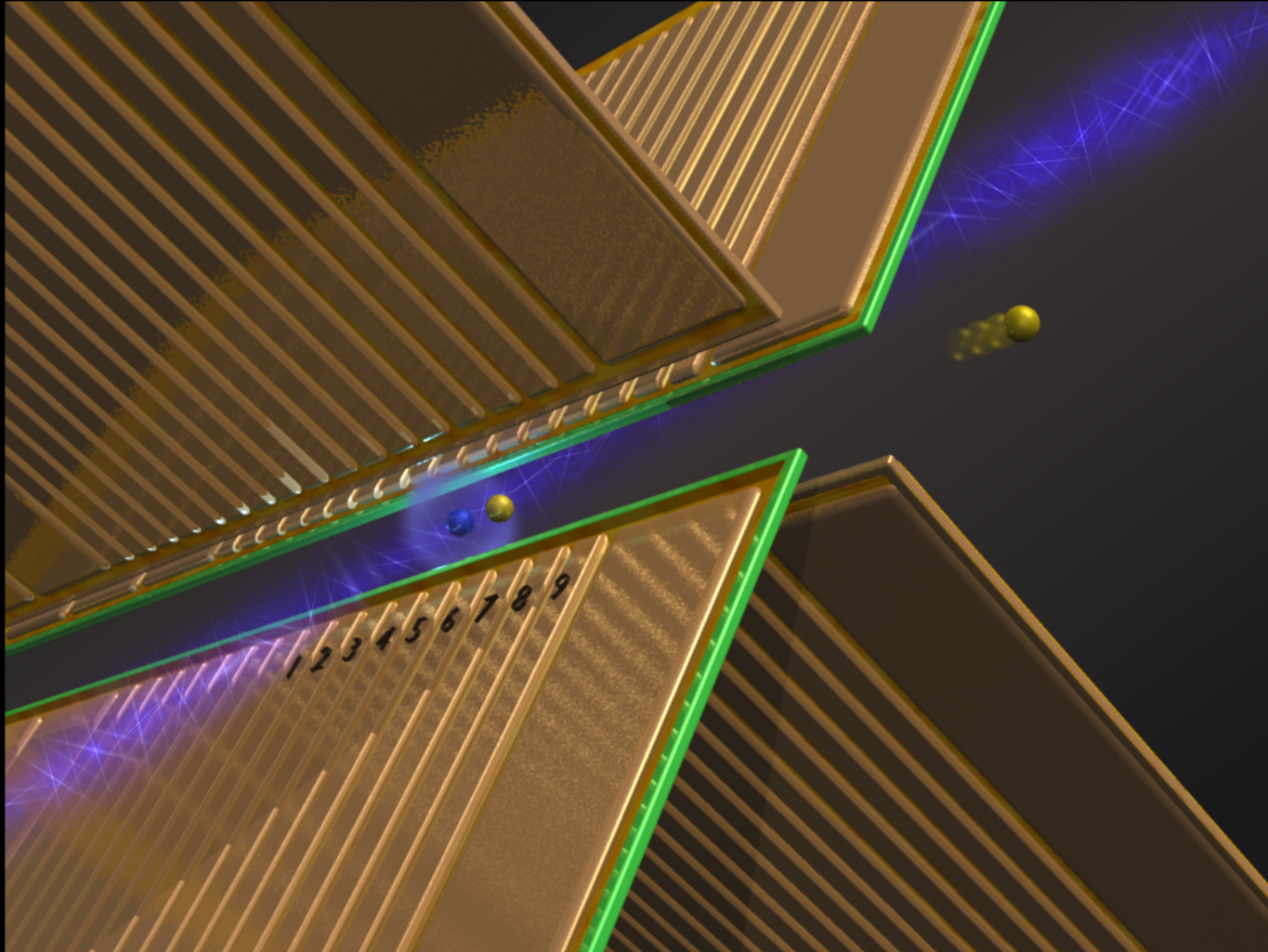
Ordinateurs quantiques



Ordinateurs quantiques

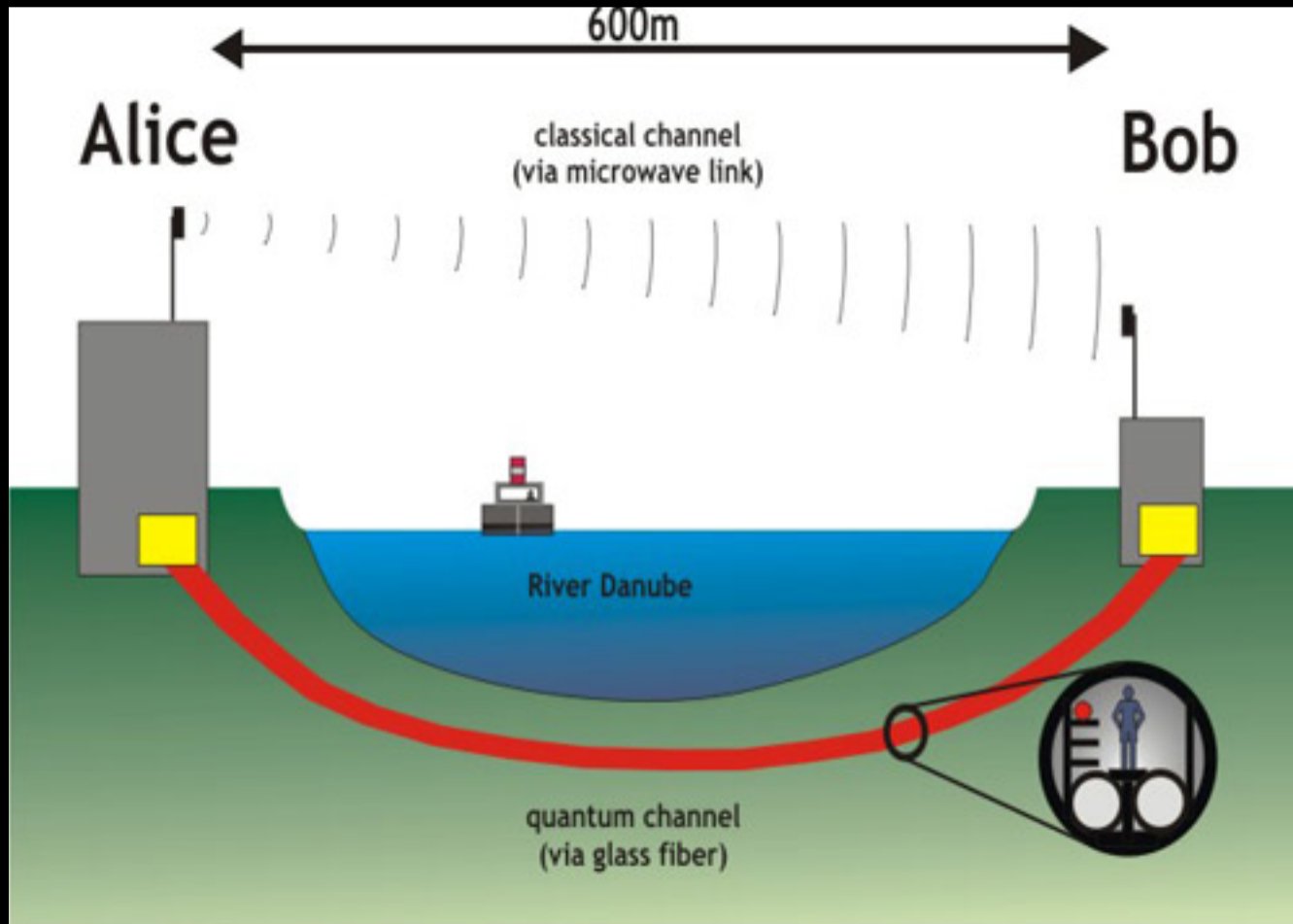


Mémoire



quantique

Communication

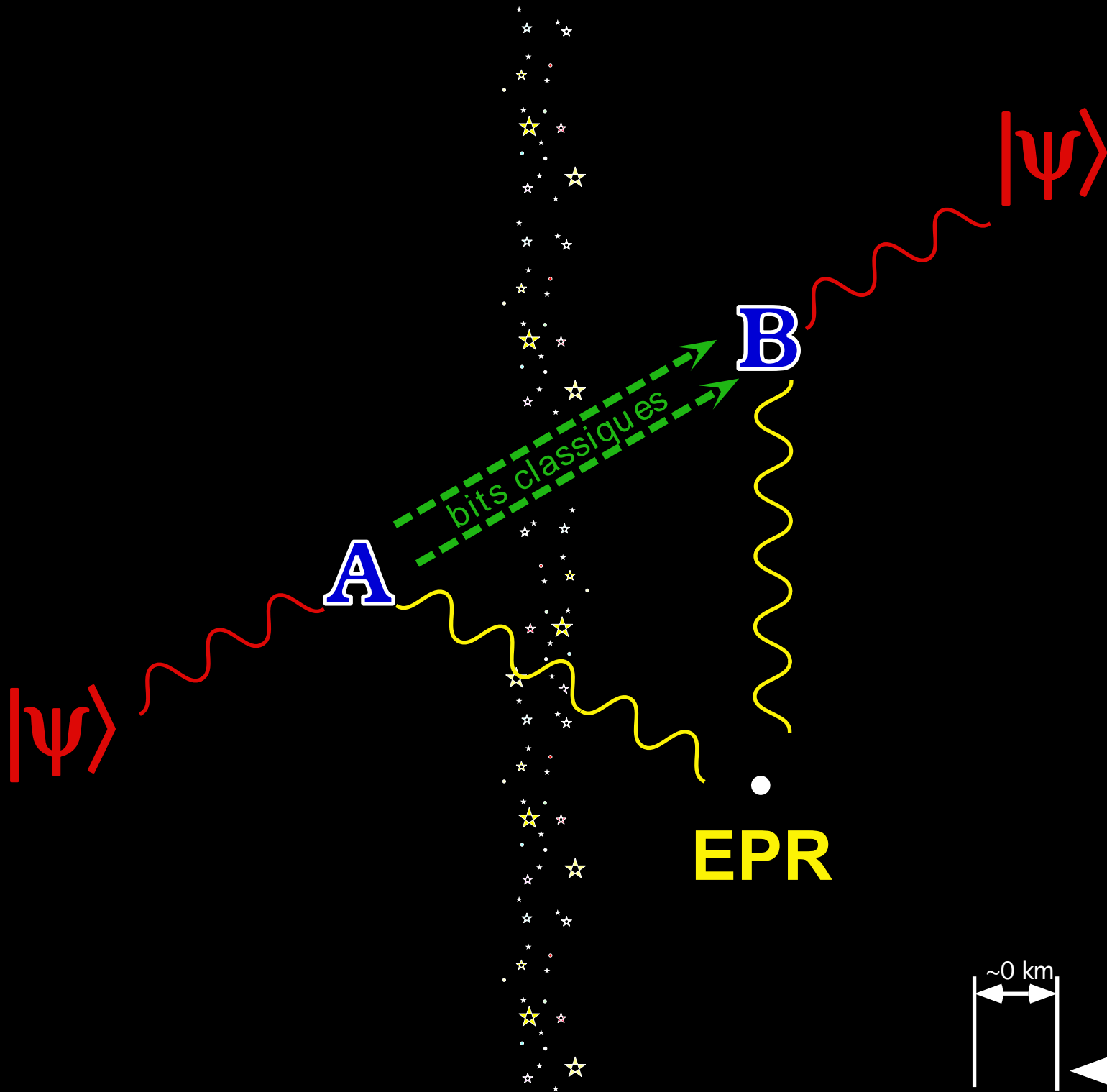


quantique

Communication



quantique

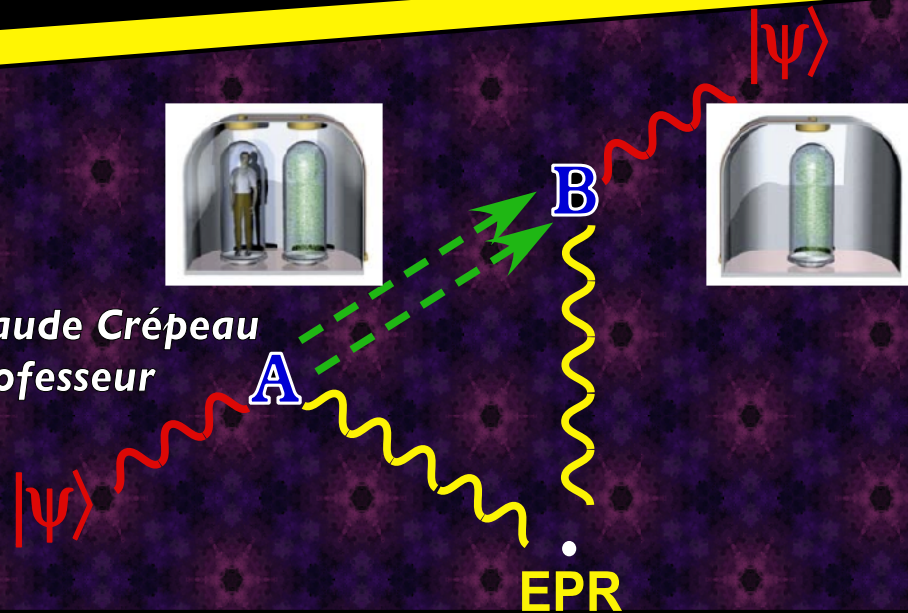


La solution à tous les problèmes !

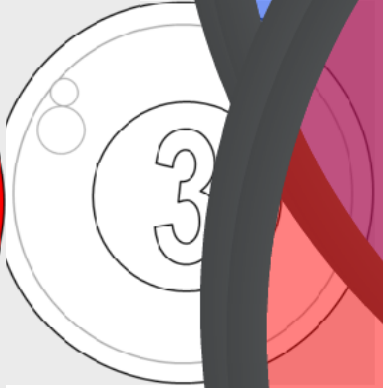
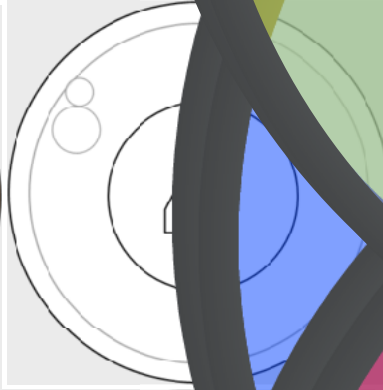
La Téléportation Quantique

POUR
LES NULS[®]

Claude Crépeau
professeur

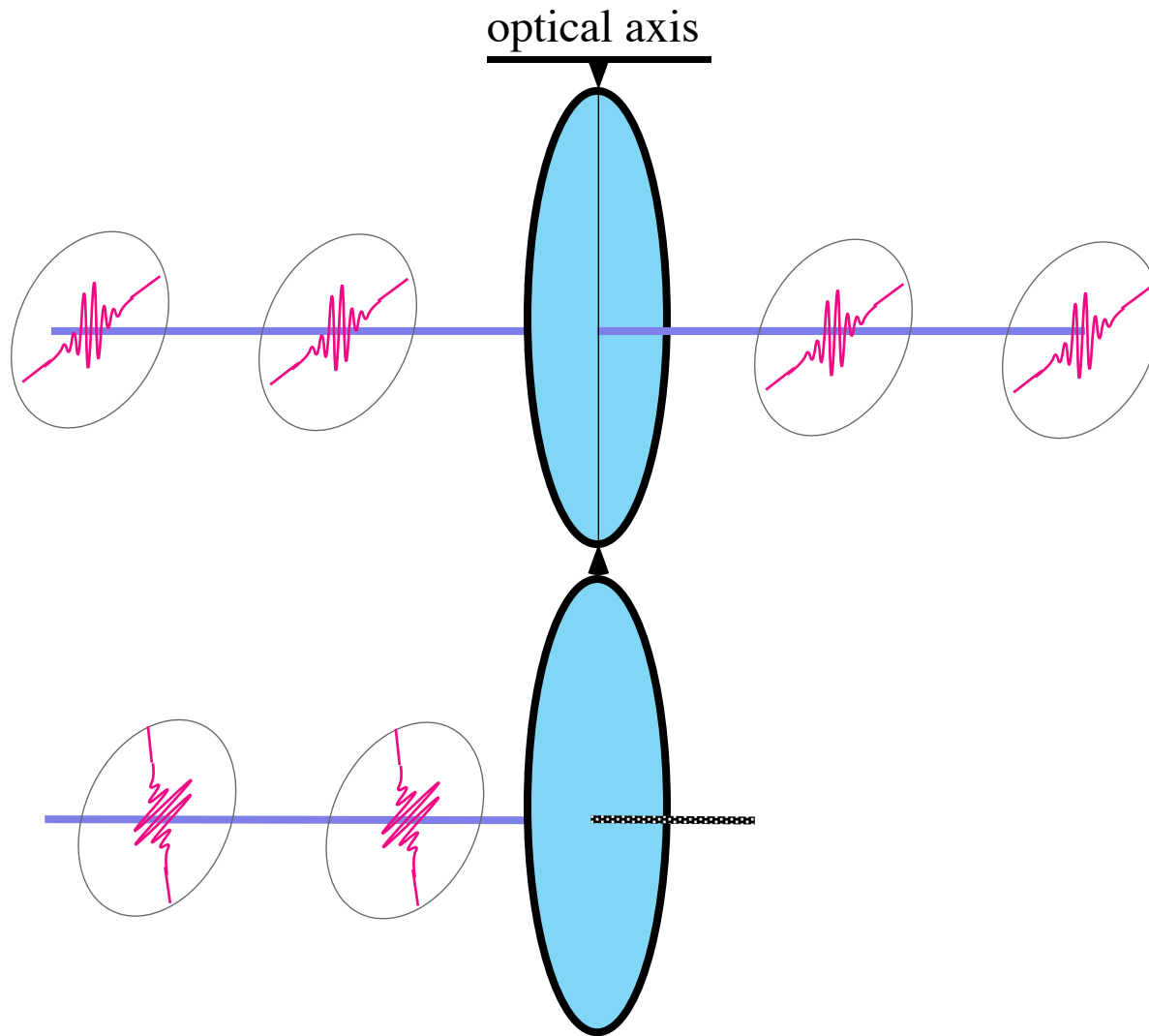


À mettre entre toutes les mains!

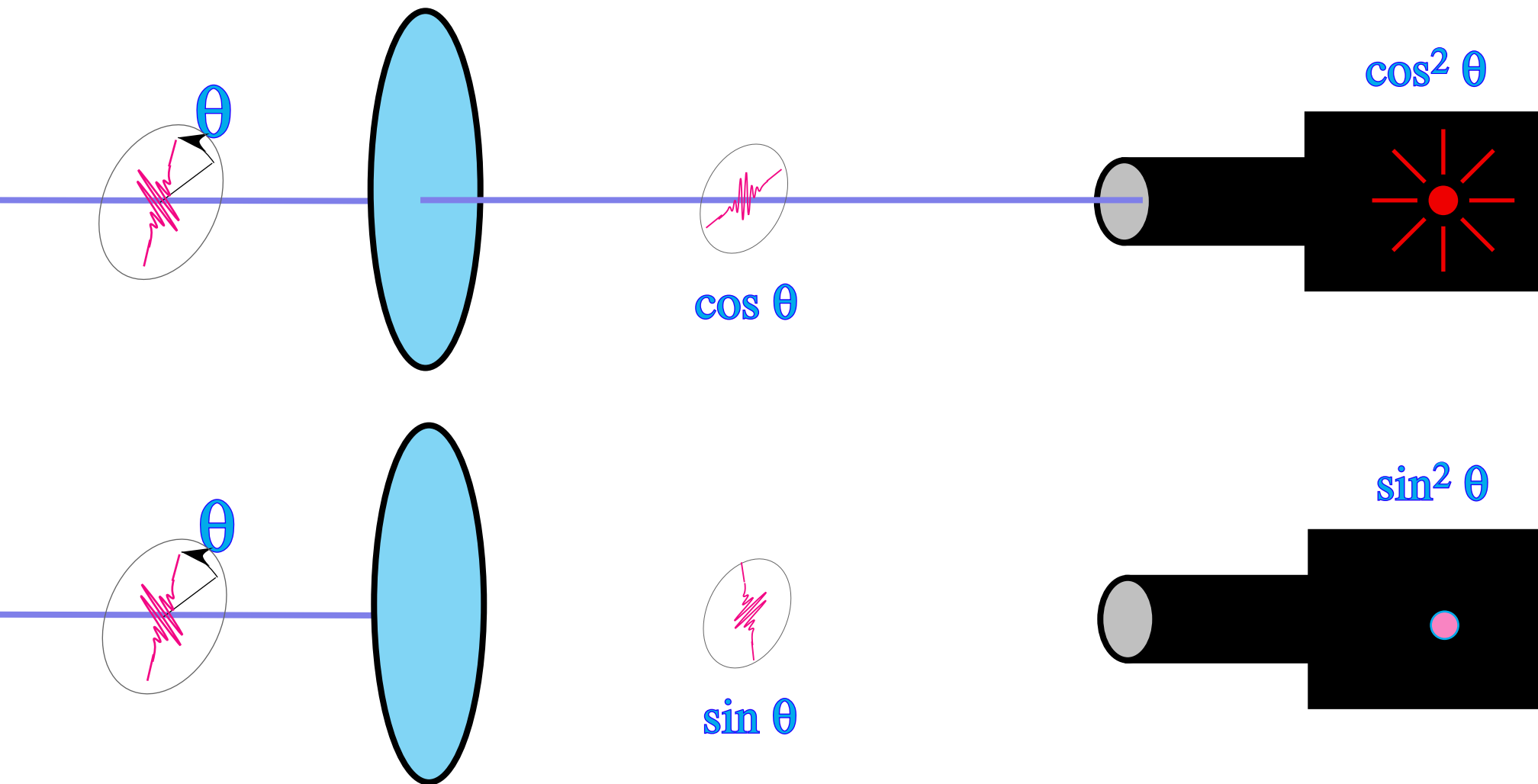


Polarization:
a quantum state

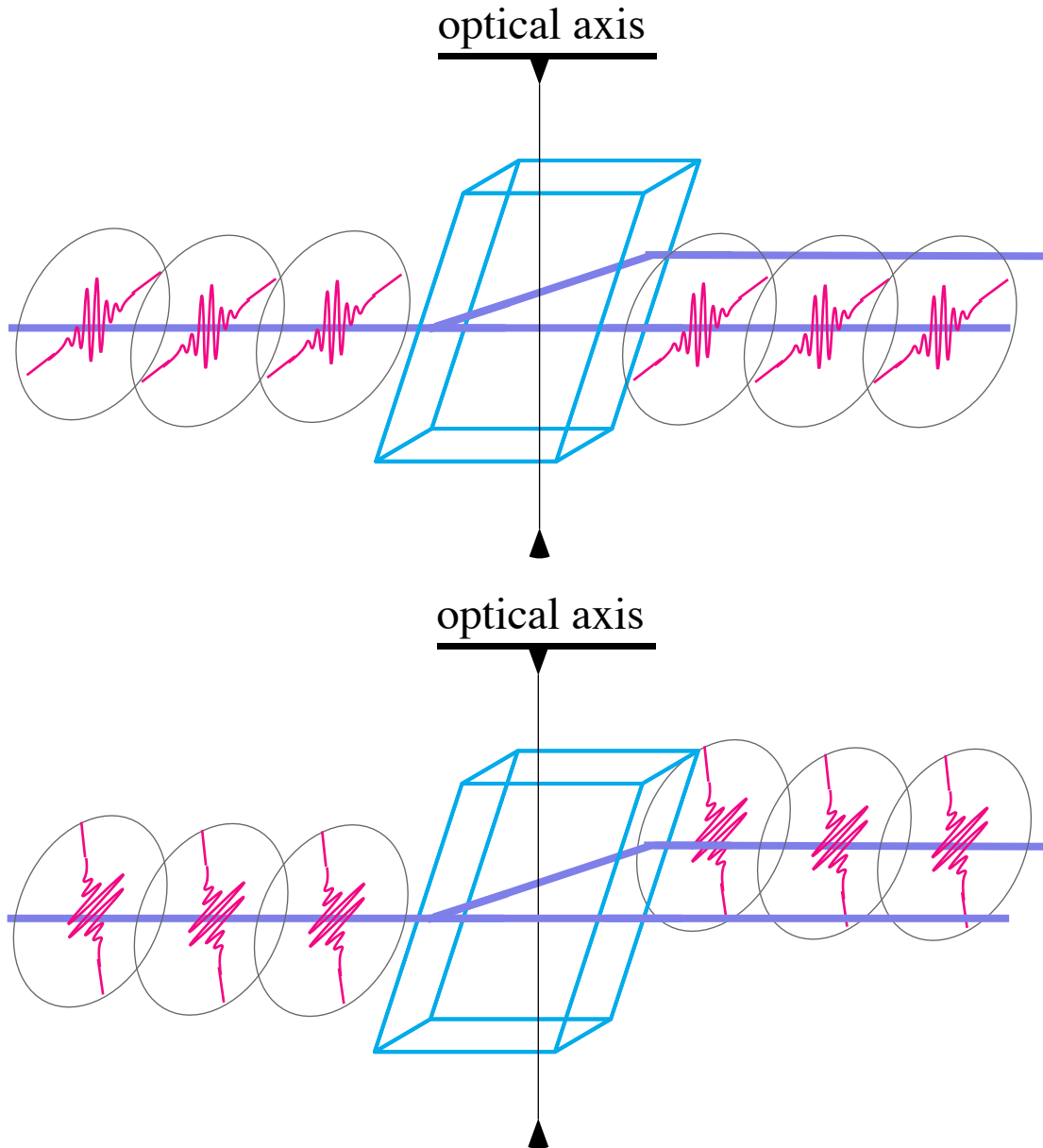
Polarizing Filter



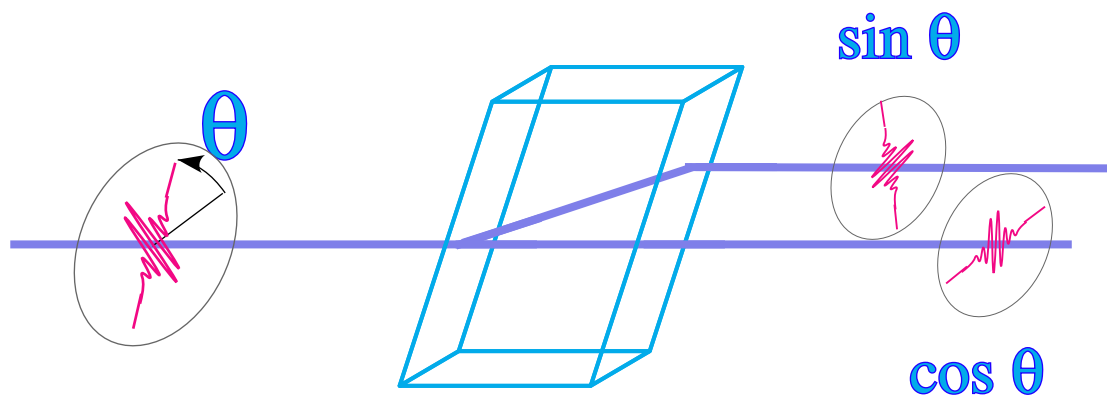
Polarizing Filter and photodetectors



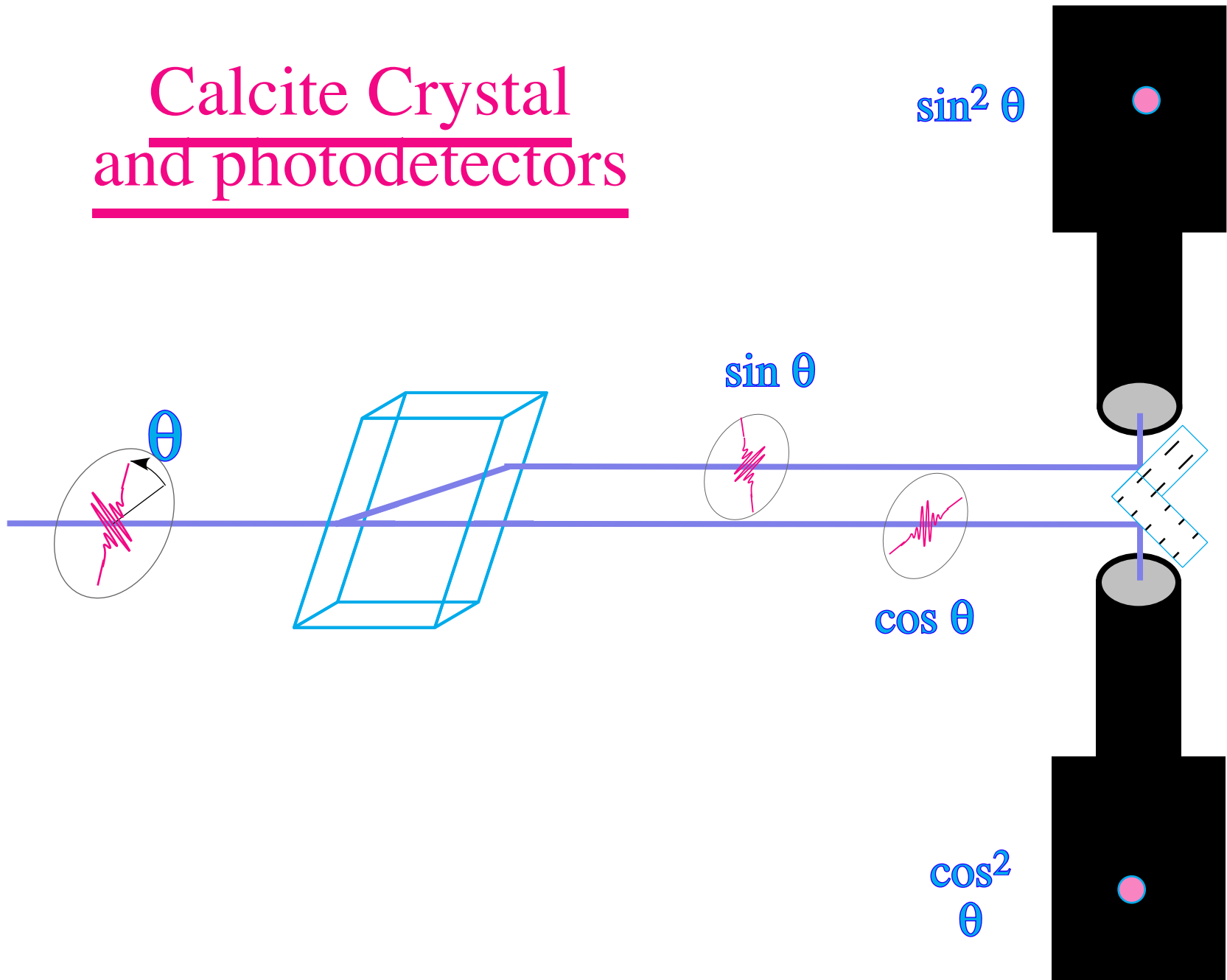
Calcite Crystal



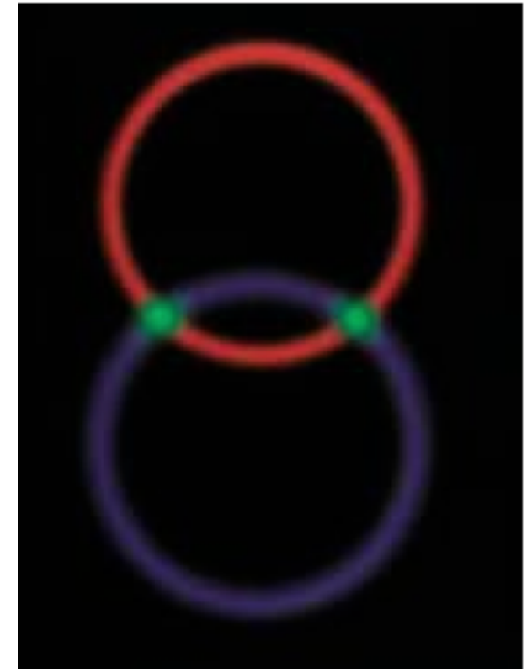
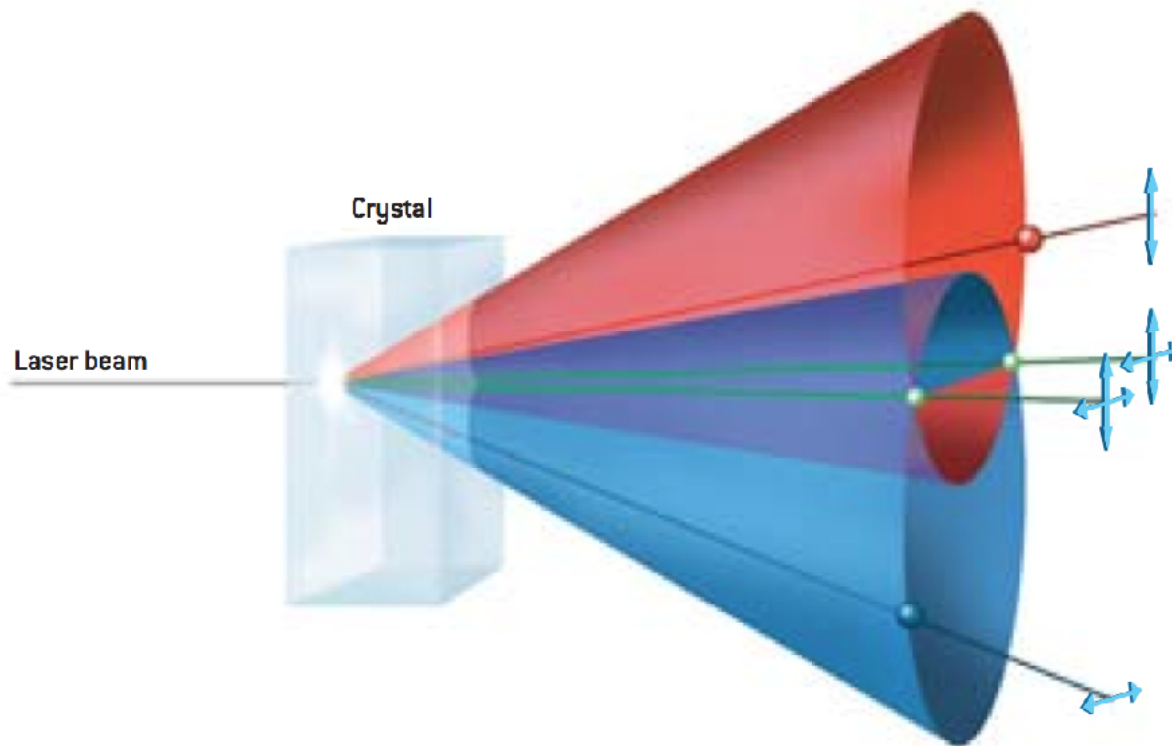
Calcite Crystal



Calcite Crystal and photodetectors

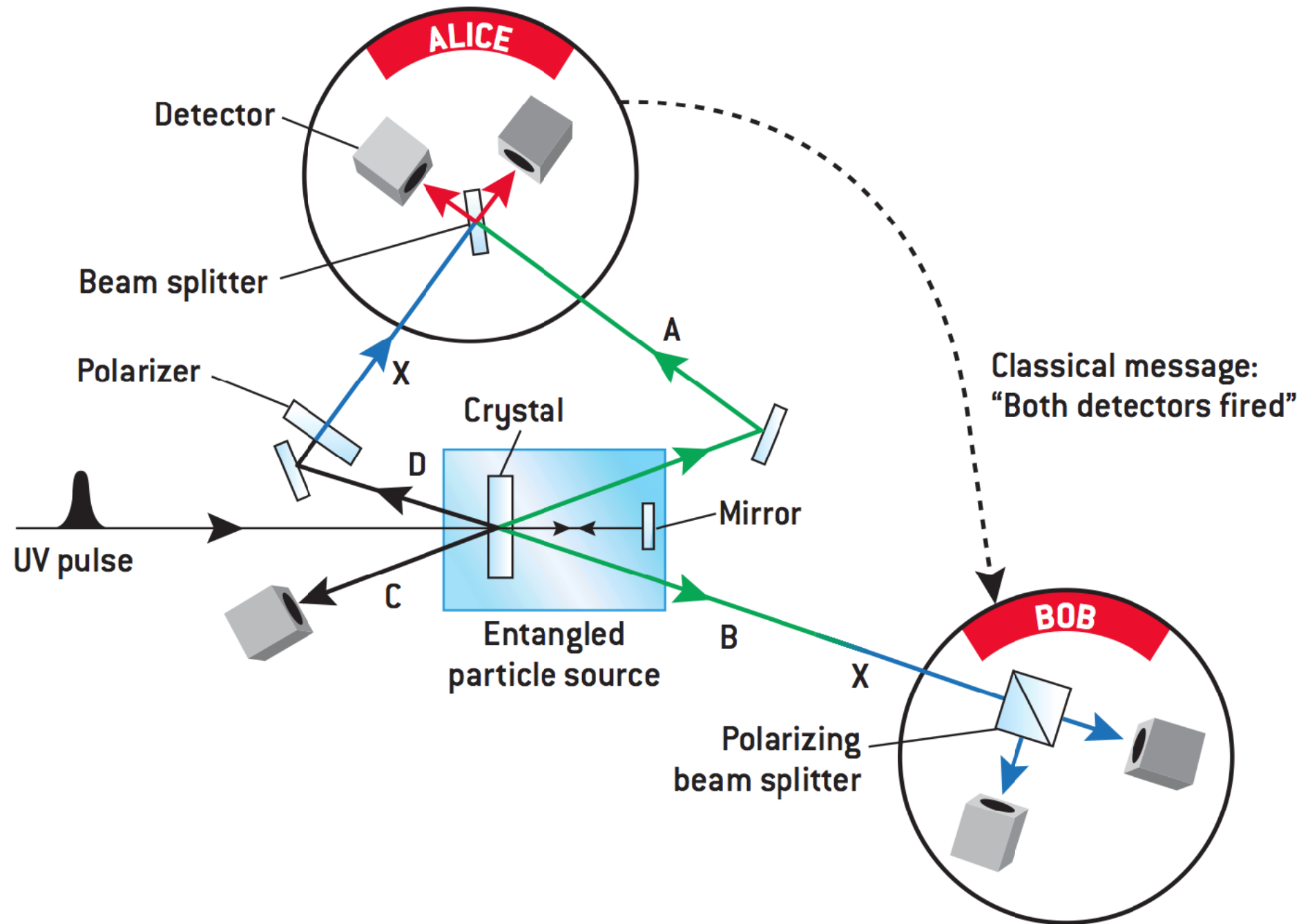


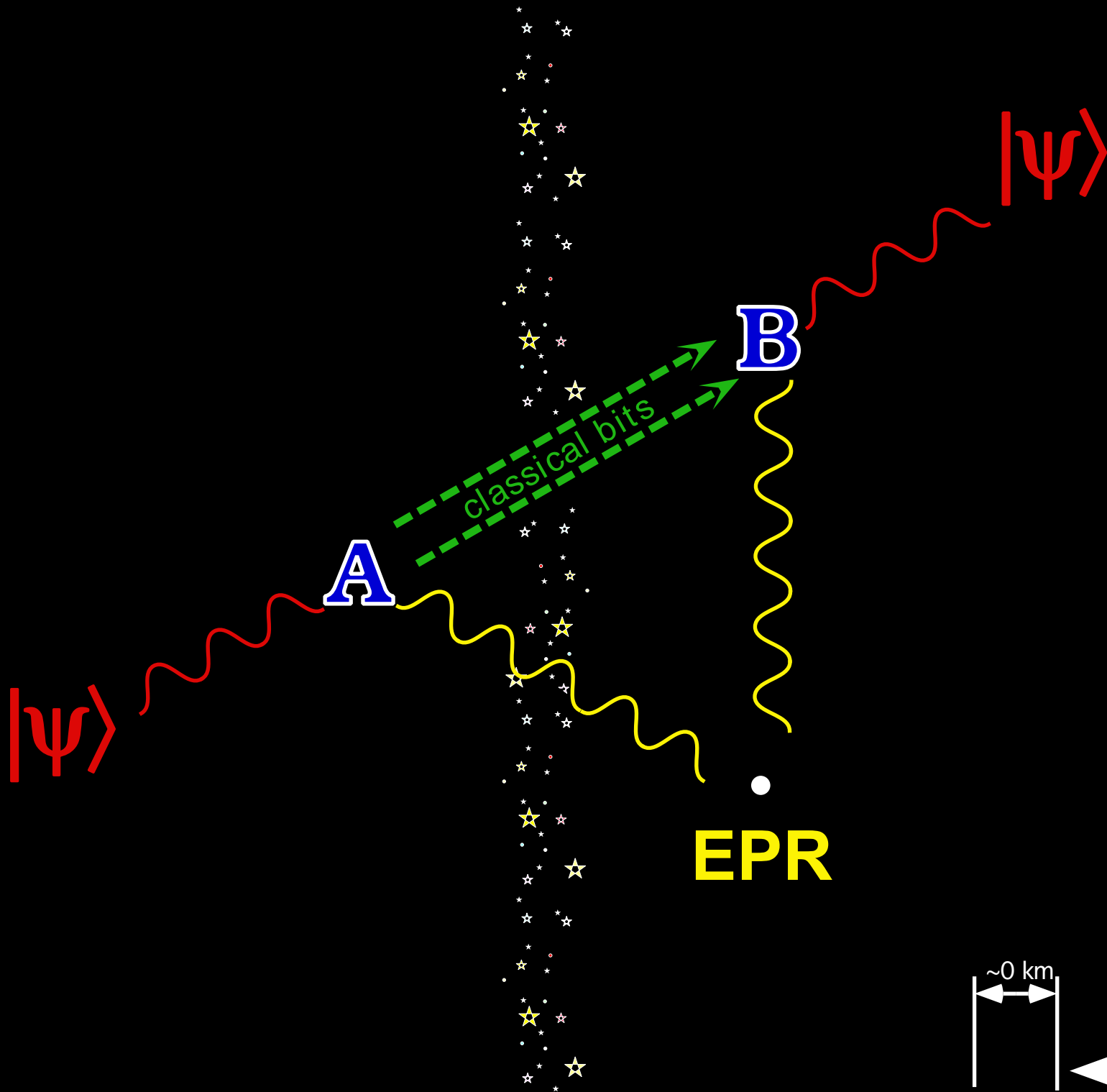
Generation of EPR pairs



LAURIE GRACE (left); P. G. KWIAT AND M. RECK
Institute for Experimental Physics, University of Vienna (right)

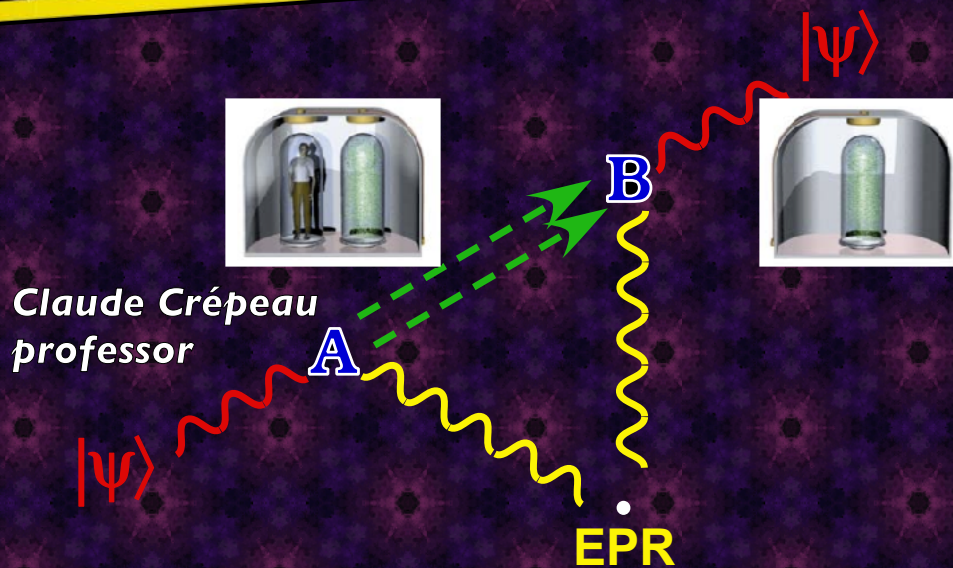
Innsbrück Experiment





The fun and easy way[®] to go green
with eco-friendly tips to help you decide how green you'll go!

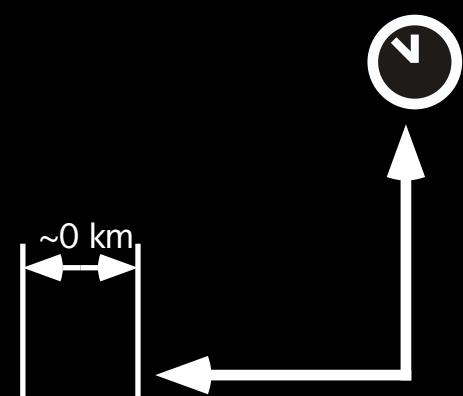
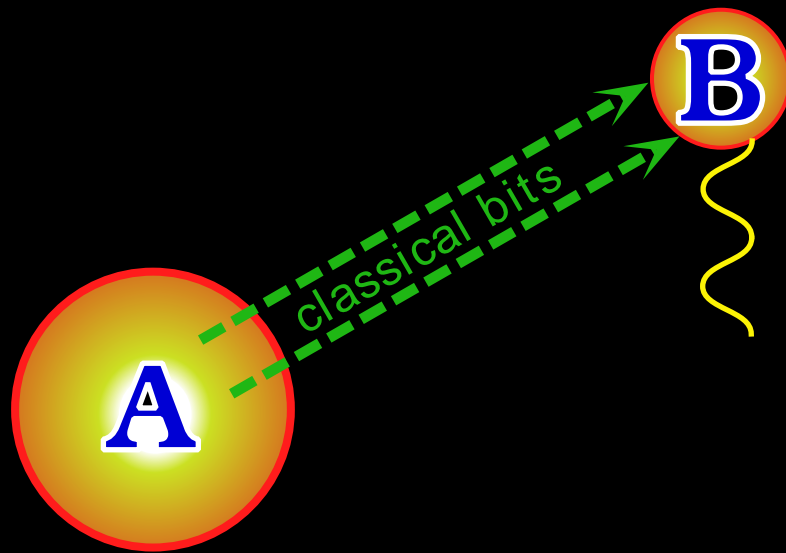
Quantum Teleportation FOR DUMMIES[®]



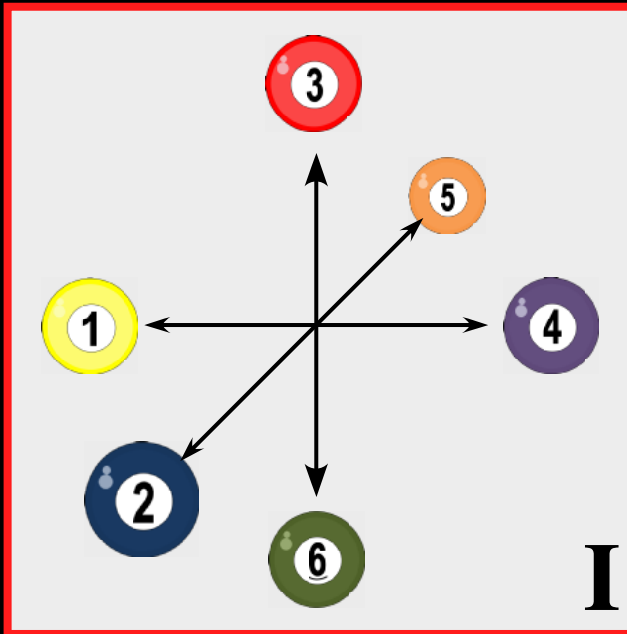
A Reference for the Rest of Us![®]



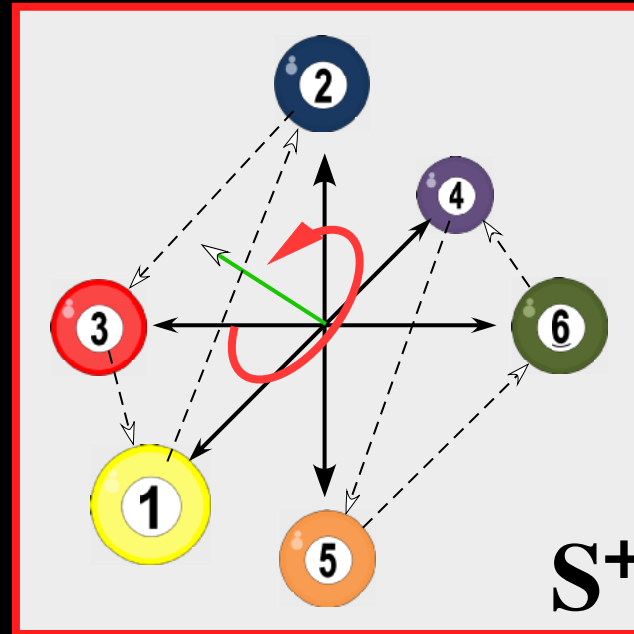
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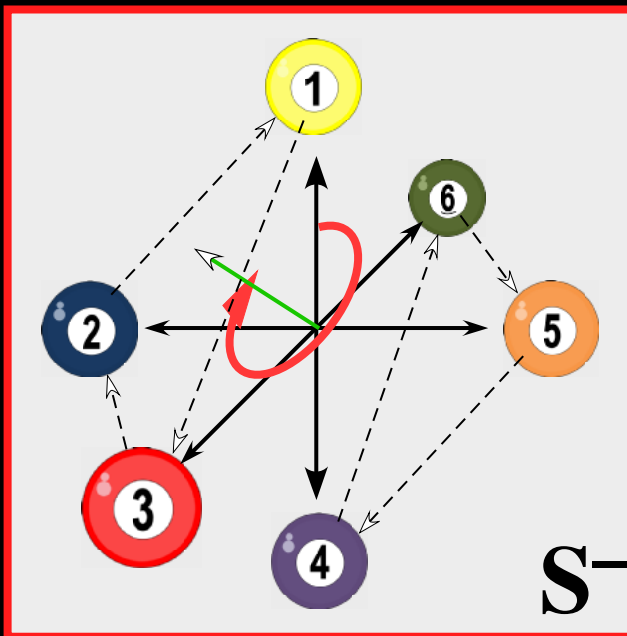
Colour Permutations



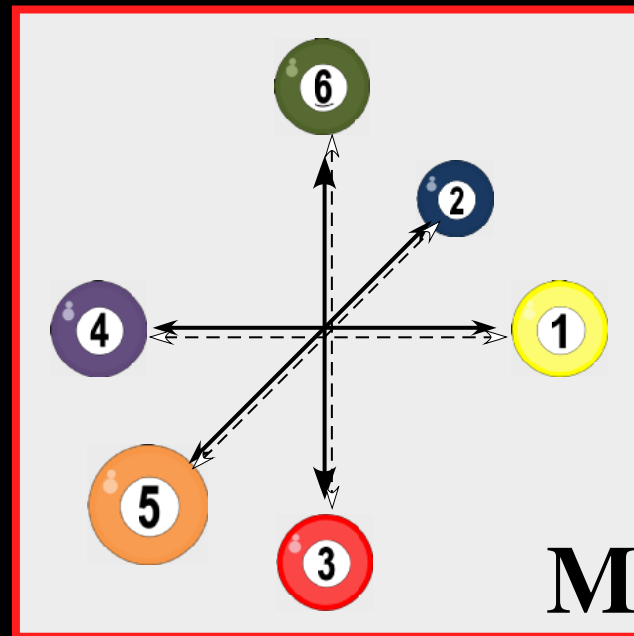
Identity



S⁺ small

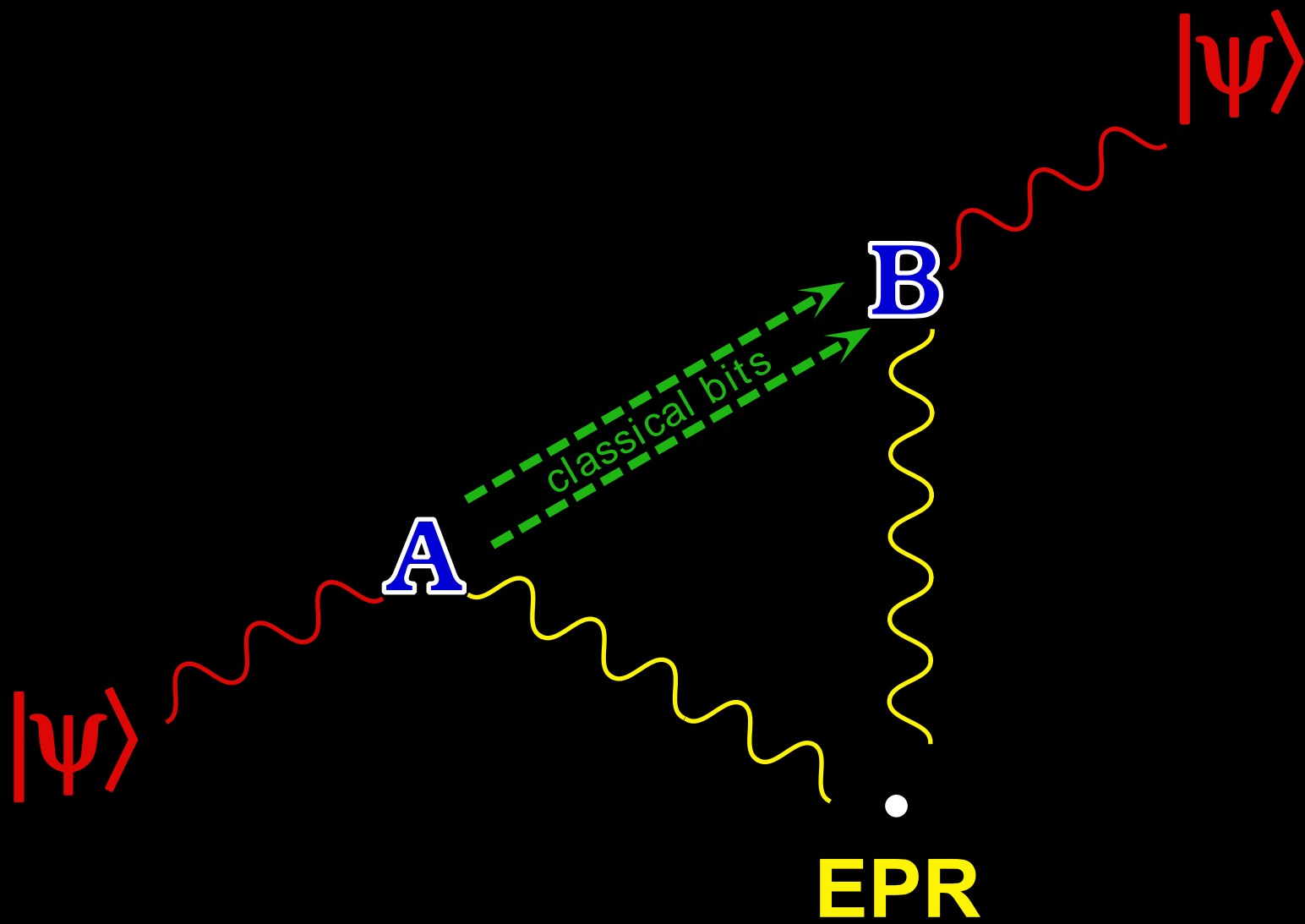


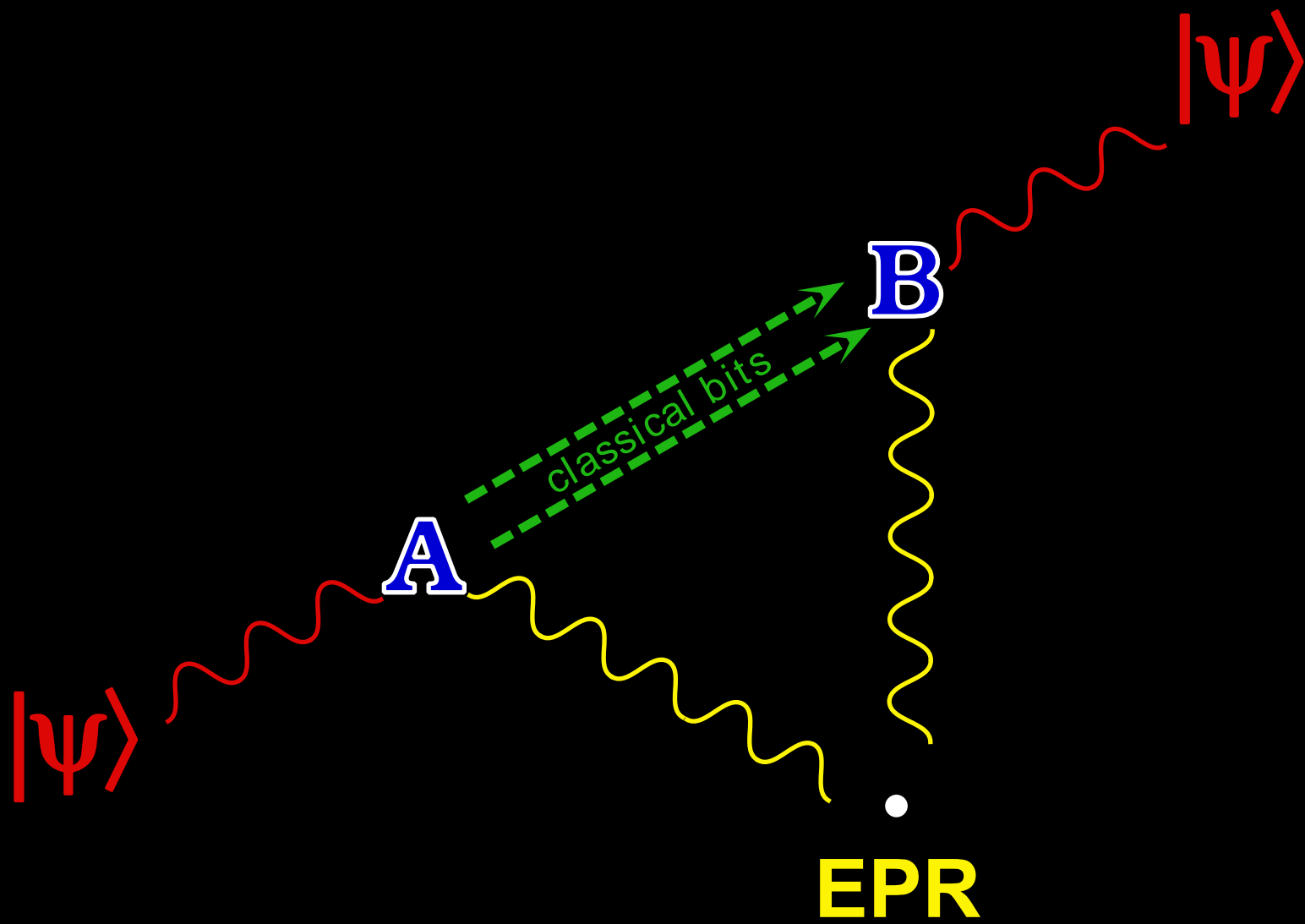
S⁻ small



Mirror

Teleportation: in general





Colours and Filters:
uncertainty is...



Albert Einstein

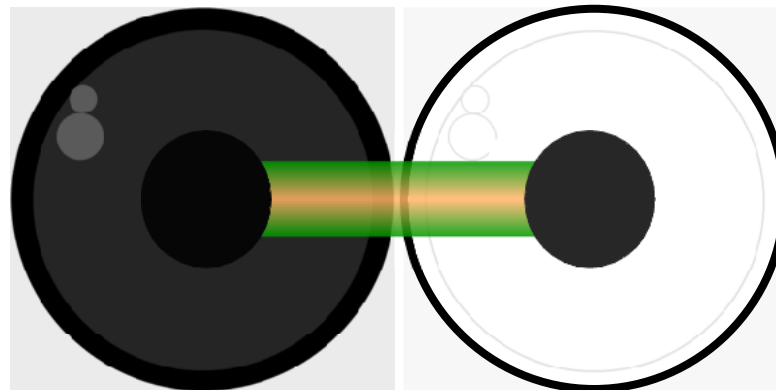


Boris Podolsky



Nathan Rosen

Einstein-Podolsky-Rosen Pairs





Albert Einstein



Boris Podolsky



Nathan Rosen

EPR pairs :
spooky action
at a distance



BELL pairs :
generalization
of EPR pairs

Transportation

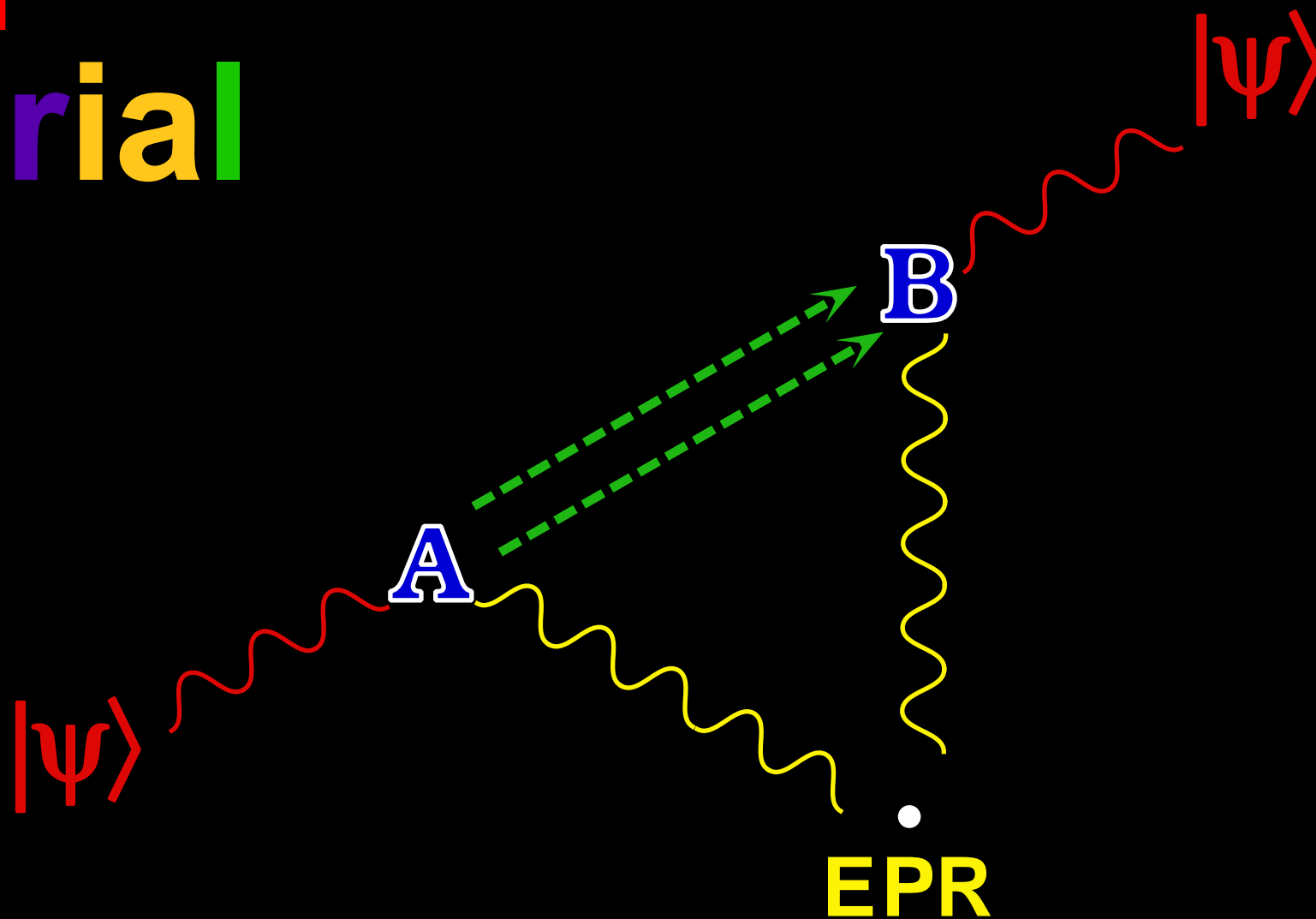
vs

Teleportation

Quantum

Teleportation

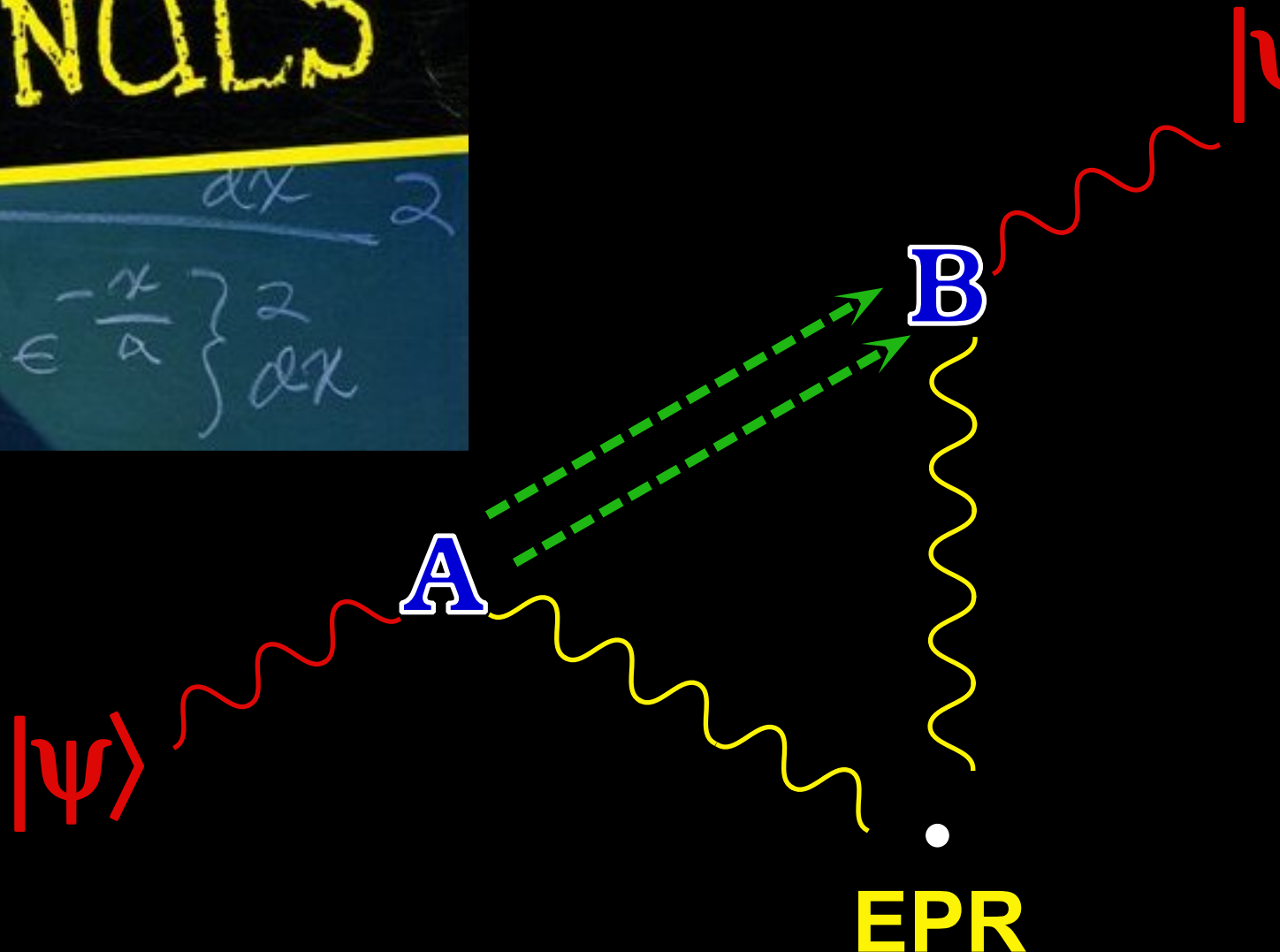
Tutorial



Géométrie, algèbre, analyse...
La solution à tous les problèmes!

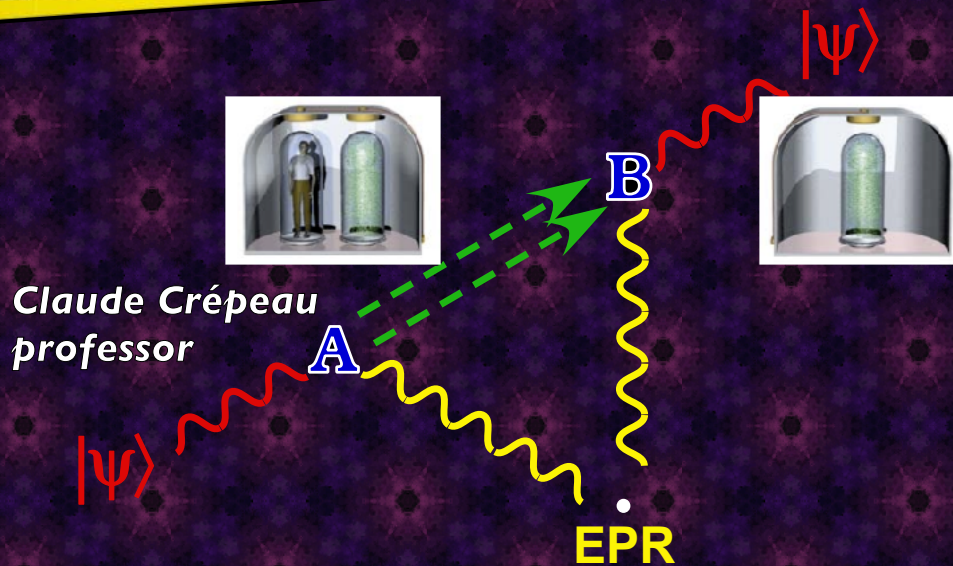
La Téléportation Quantique

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Quantum Teleportation FOR DUMMIES[®]

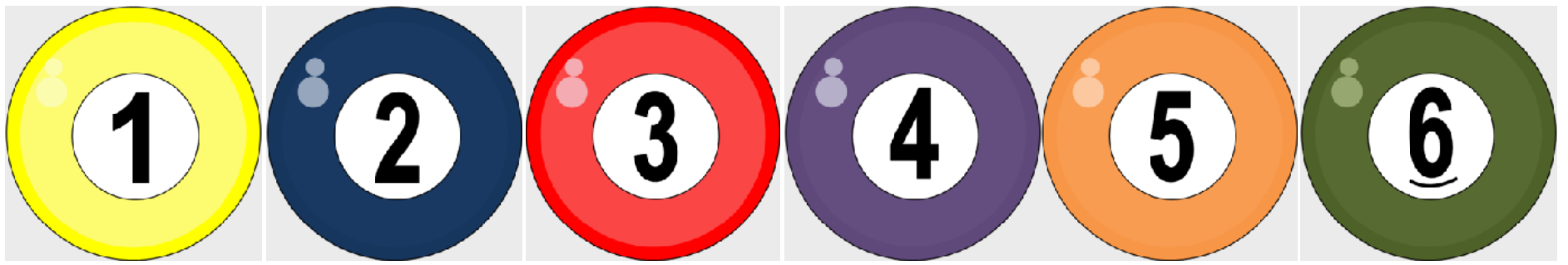


A Reference for the Rest of Us![®]

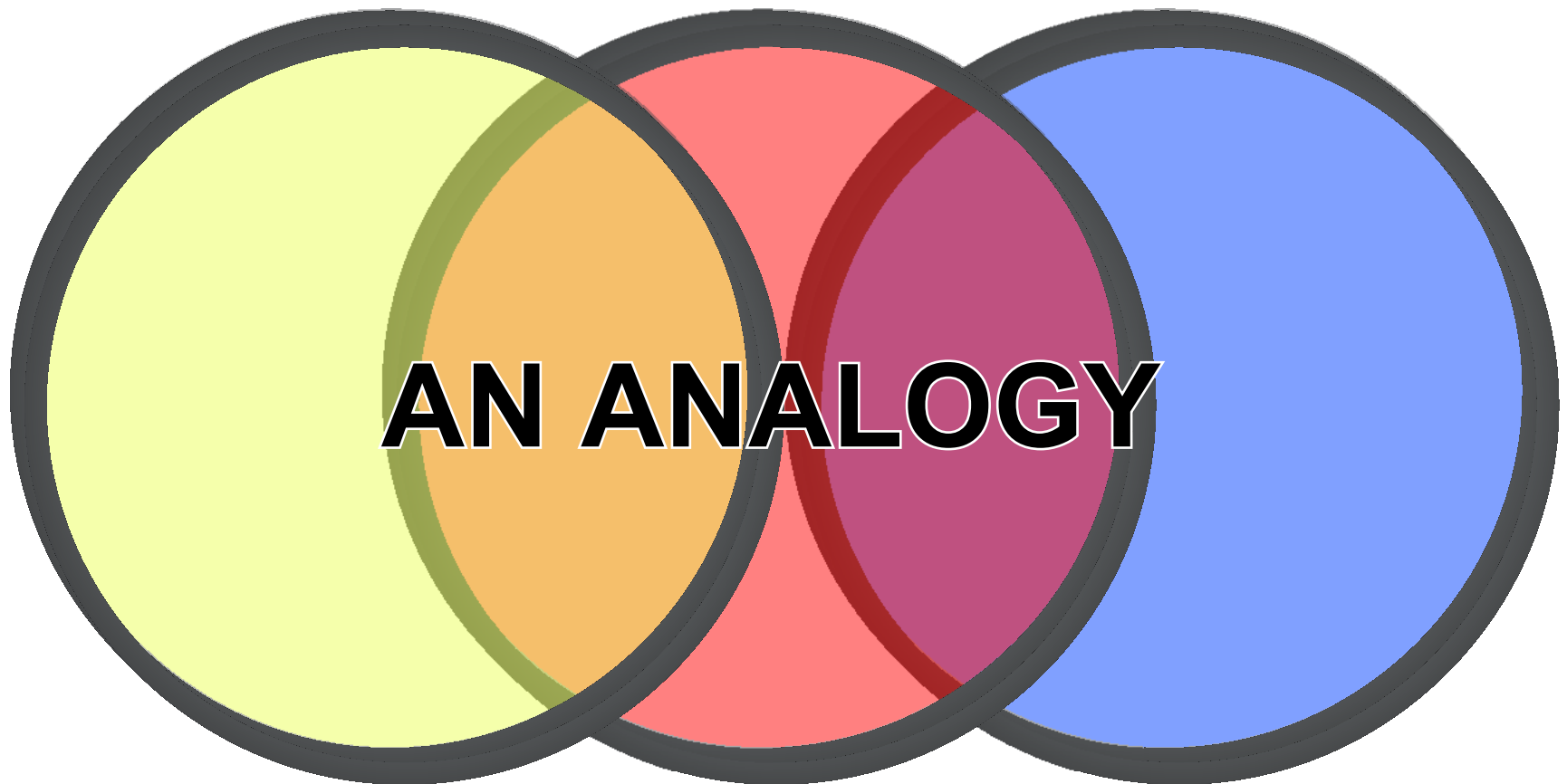


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Quantum Information



Colours and Filters



Colours and **Filters**:
but really what is going on...

Colours and Filters:
the only certainty is...

Teleportation

